

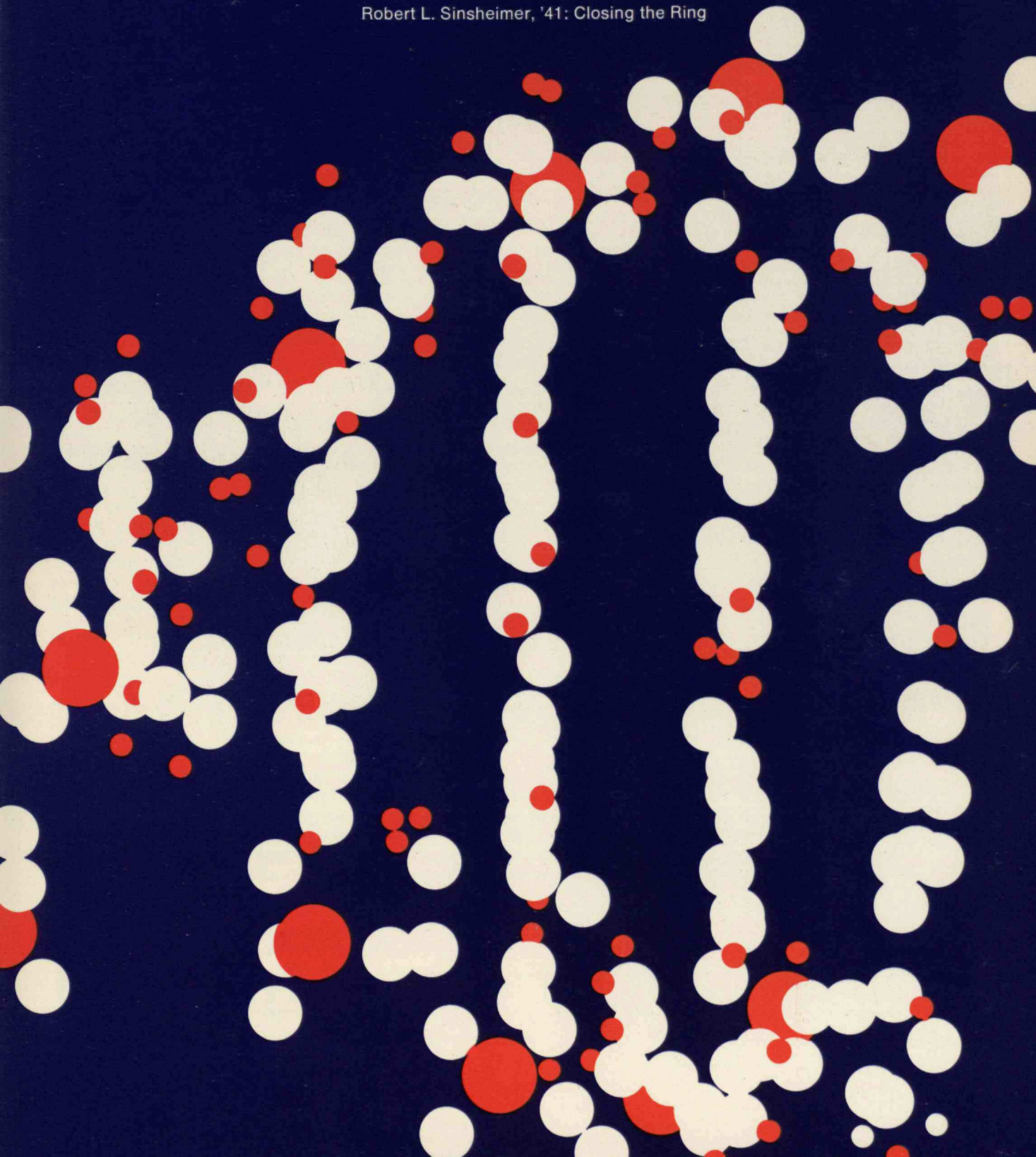
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John F. Collins: Technology for the Urban Crisis
Geoffrey Kemp: The Nuclear Arms Race
William K. Widger, Jr., Sc.D.'49: Meteorology by Satellite



Technology Review

Robert L. Sinsheimer, '41: Closing the Ring



technology review

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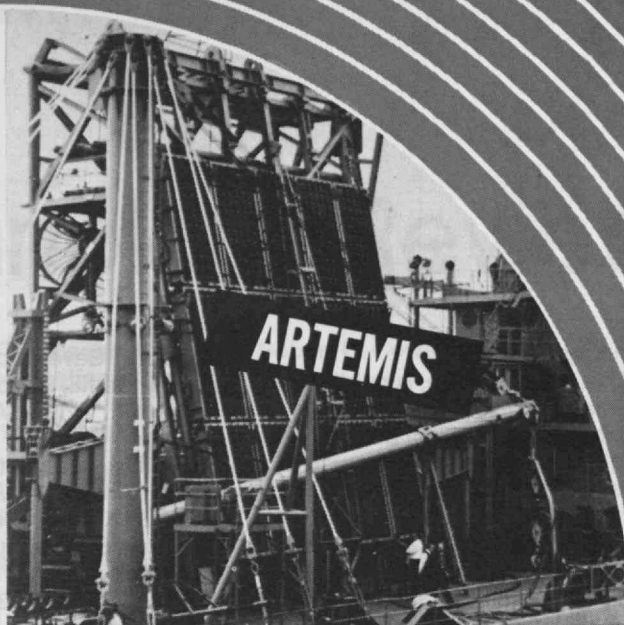
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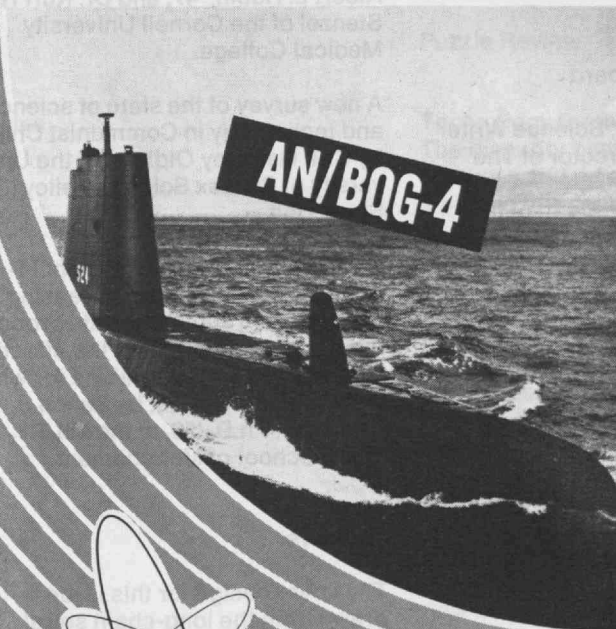
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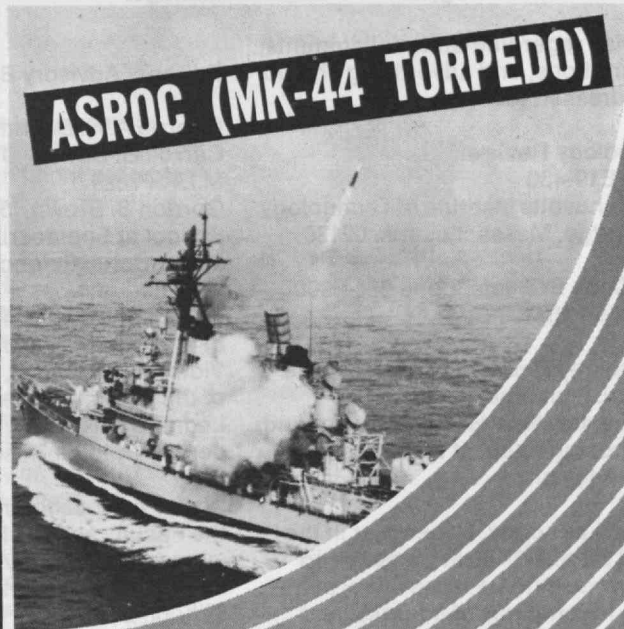
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Next issue

The first issue of *Technology Review's* Volume 71 will be dated October/November, 1968. Its contents will include:

Collagen as a Biomaterial, an account of research into the surgical uses of this ubiquitous fibrous protein by Dr. Albert L. Rubin, '47, and Dr. Kurt H. Stenzel of the Cornell University Medical College.

A new survey of the state of science and technology in Communist China by C.H. Geoffrey Oldham of the University of Sussex Science Policy Study Unit.

An essay on how management information systems can increasingly depend upon automatic data processing without jeopardizing the effectiveness of the decision-makers for whom the data are planned, by Zenon S. Zannetos, Ph.D. '59, of the M.I.T. Sloan School of Management.

The cover

The cover design for this issue is drawn from the long-chain spiral forms typical of the DNA molecule; for an account of developments leading to the first synthesis of this remarkable material, see page 22.

Volume 70

This issue completes Volume 70 of *Technology Review*. An index to the volume will be available without cost from the Editors late in 1968.

Technology Review

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Materials research: today's growth technology.

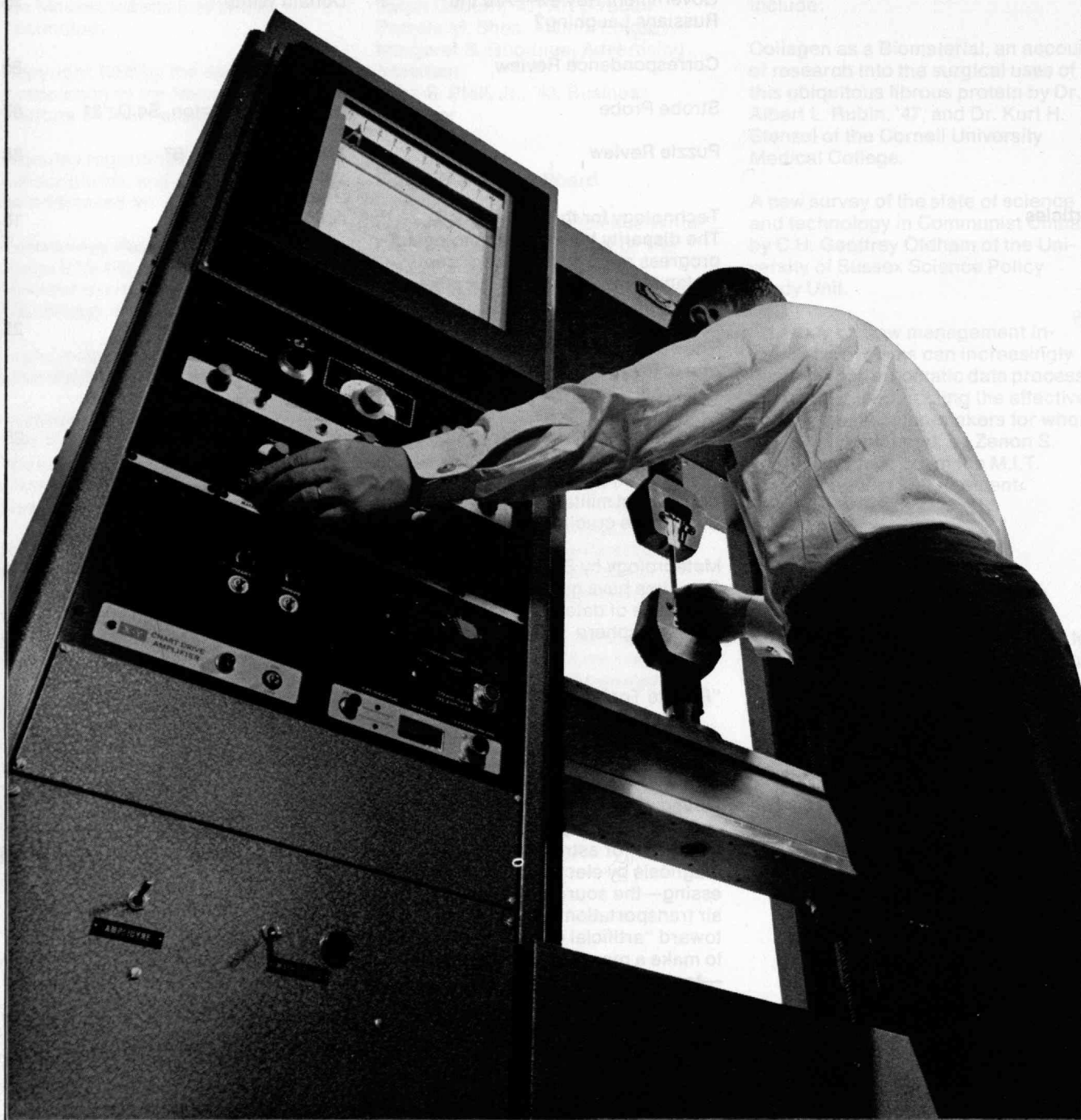
Since the end of World War II, materials research and development has become a priority technology. Its growth has been marked by a new language: viscoelastic properties, complex modulus, tensile energy absorption, rheology — the terminology of the space age. And its growth has been marked by an ever increasing need for imaginative materials researchers together with versatile, precise test equipment matched to their advanced needs.

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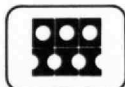
As surely as numbers were coded to make adding machines possible, and letters were coded to make the telegraph possible, and arithmetic was coded to make computers possible, so visual information has to be coded in order that we can manipulate it at high speed. Not just translate it from one form to another, but interpret it and act upon the interpretation.

That is our business, manipulating visual information using optical, electronic, and programmed devices. Systems we have delivered are now reading oscilloscope wave forms, analyzing seismograms and oil well logs, extracting positional data from theodolite photographs, examining biomedical samples, interpreting oceanological film, cleaning up soiled engineering drawings, making charts and graphs from digital data. But these are only beginnings.

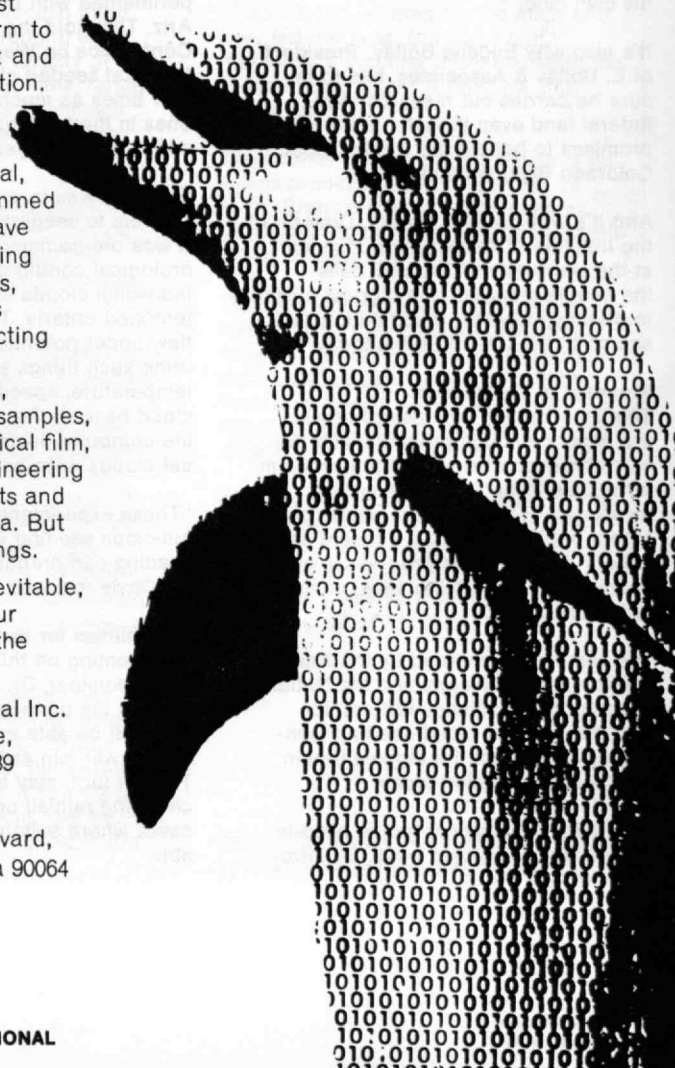
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The People Problem in Weather Modification

The trouble with trying to change the weather is people. They can be more of a nuisance than the tangle of physical processes that control the atmosphere—and they're bad enough.

Meteorologists feel they can get at least a loose grip on some weather processes given the right kind of research. But even when would-be weather changers think they know what they're doing, people can still trip them up. People can pass restrictive laws, institute law suits and even take pot shots at aircraft to discourage cloud seeders.

That's why Charles L. Hosler, Dean of the College of Earth and Mineral Sciences at Pennsylvania State University, has a parcel of woodland that he says little about. If someone tries to blow the whistle when he's seeding clouds he can at least say he was over his own land.

It's also why Eugene Bollay, President of E. Bollay & Associates, has to be sure he carries out research over federal land even though his project promises to benefit the whole Upper Colorado River watershed.

And it's why Louis J. Battan, Director of the Institute of Atmospheric Physics at the University of Arizona, calls the people problem "the biggest obstacle to effective weather modification research in the United States today."

Progress in Techniques

This also implies that meteorologists are making enough progress with the scientific-technical side of the problem for people to begin to take notice. As Messrs. Hosler, Bollay, Battan and others outlined it during a recent science writers' seminar, this progress is encouraging, even though small compared to the challenge.

The seminar, sponsored by the American Meteorological Society and the National Association of Science Writers, focused largely on cloud-seeding techniques. These are the biggest tool in weather modification today.

Generally, the seeding tool is used in two basically different ways. By intro-

ducing an "ice nucleating" agent, such as silver iodide, into a supercooled cloud, a multitude of tiny ice crystals can be formed. In some cases, these provide a basis for growth of larger crystals and/or raindrops that eventually precipitate to the ground.

Alternatively, it may be more important that the seeding, by causing supercooled cloud droplets to freeze, releases a lot of heat energy into the cloud.

This is the latent heat taken up when ice melts and released when water freezes. In favorable cases, it can pep up convection to the point where a cloud will develop strongly and precipitate, whereas it would have languished without man's intervention.

Larry G. Davis and A. I. Weinstein at Pennsylvania State University experimented with this near Flagstaff, Ariz. They told the first National Conference on Weather Modification in May that seeded clouds produced almost four times as much rain as unseeded ones in the tests run during July and August last year.

The trick was to pick out the clouds susceptible to seeding. A computer helped. It was programmed to compare meteorological conditions in and around individual clouds with a set of predetermined criteria. The seeding aircraft flew under potential target clouds measuring such things as cloud base height, temperature, speed of updrafts, and cloud base radius. From these data, the computer decided whether individual clouds were worth seeding or not.

"These experiments demonstrate that judicious seeding versus indiscriminate seeding can produce significant results," Dr. Davis reported.

Possibilities for the Future

Commenting on this general approach at the seminar, Dr. Hosler said that it holds the promise that, in many cases, man will be able to determine which clouds will rain and which will not. This, in turn, may be a technique for changing rainfall or snowfall patterns in cases where suitable clouds are available.

Dr. Hosler has experimented with winter storms that sweep across the Great Lakes to dump up to two to three feet of snow in a narrow band along the windward shore. These storms pick up warmth from the lake even when the water is ice-covered. What's more important, the rise in friction when the air moves off the lake over the land causes air to pile up and augments convection, and down comes the snow. By seeding, Dr. Hosler has made the snowfall spread out into a wide band so that no locality gets more than a few inches. The trials were so successful that he calls the technique "operational. It's up to the lakeshore communities now to decide whether or not they want it," he said.

Mr. Bollay hopes to use this general technique over the Upper Colorado River watershed. He's working with a project sponsored by the United States Bureau of Reclamation. By seeding the "right" clouds, he thinks it would be possible to add another million acre feet, on the average, to the river's annual flow. The trick is to learn to identify the "right" clouds. That might take 10 years of research and trials.

The cloud-seeders have to be prepared for surprises, too. Roscoe R. Braham, Jr., and his associates at the University of Chicago, were brought up short in their Project Whitetop seeding experiments in Missouri between 1960 and 1964. They got net decreases in rainfall when they expected increases. In retrospect, it turned out that regional factors caused the clouds to be heavily seeded naturally. The project's efforts often overseeded the clouds, splitting up available water among so many cloud particles that the precipitation was reduced.

All of this points up the basic hope, and need, of weather modification research—to learn enough about cloud and general weather dynamics to identify when, where, and how a small intervention by man will have desirable large-scale effects.

Frustrations: People and Laws

Unfortunately, as this research begins to show a little promise, the researchers

Though a landscape may seem empty of humans and their works, "the people problem" will haunt weather modifiers because what they do may seem to threaten changes far away. The restraints which confront modern meteorologists arise from fear and ignorance—and from lack of basic laws to regulate and protect experimenters and commercial cloud-seeders. (Photo: Ewing Galloway)

Of Many Books

are running into nonscientific frustrations. Partly it's a matter of money. As Dr. Bollay put it, "There is no such [thing as] a national program in weather modification [in the United States] today. There are many sub-critical programs in existence. It is my estimate that another decade may pass with minor progress, whereas a concentrated effort with adequate resources could produce an operating system within three to five years." By operating system, he referred specifically to his Colorado work.

The seminar members seemed to agree with Dr. Hosler that an effort funded at \$100 million a year in a well-conceived program would be about right to get the research moving at optimum speed. That would be 10 times the funding level now. It sounds high with the federal budget so tight, yet, as Dr. Hosler noted, providing fresh water in the decades ahead can be called a high-priority national goal.

Then, and more frustrating by far, there is the people problem mentioned earlier. Some of these restraints are due to fear and ignorance. Some result from lack of adequate basic laws to regulate and protect the experimenters and commercial seeders. Dr. Hosler has run into the fear and ignorance. He explained it this way:

"Most of Western civilization has discarded belief in the multiplicity of Gods . . . and the tendency has been to attribute weather control to the one God of the Old Testament prophets. . . . It should surprise us very little, then, to find people with fundamentalist inclinations hesitant to accept man's intervention in this realm and viewing those who try to intervene much as early New Englanders viewed witches.

"A commercial hail-prevention program and the recurrence of severe droughts induced some Pennsylvania farmers to become quite obsessed with the idea that all of their troubles were due to man's meddling with nature. . .

"Thus we find adult and respected members of some Pennsylvania communities willing to threaten bodily harm to

modern witches and to accuse them in writing of: 'causing drought, emphysema, destroying the fertility of eagles, causing famine in India, rendering vegetation poisonous to animals and man, defying God, plotting with competitors to ruin crops,' etc.

Several pieces of legislation have been introduced into the State Legislature aimed, in part, at curbing weather control activities; two bills finally were passed and became law."

This points up the need for federal law to regulate what obviously is an activity that goes beyond a single state's lines. However, simple legal liability deters weather modification research more strongly than the kind of local harassment Dr. Hosler encounters. Dr. Battan commented, "There's no body of law to regulate who owns water up in the sky. Absence of a protective clause in weather modification research contracts is going to hold up business in this country.

"In the Atomic Energy Commission enabling act, there's provision for indemnifying contractors up to \$500 million. There's no such provision for weather modification contractors. If you do cloud seeding for the government, you have to get your own liability insurance, if you can.

"I was doing seeding for the state and over federal land. But I was told, 'the state is immune [from law suit], the federal government is immune, but you're not!'"

The federal government has to face up to this problem, especially since, as in Dr. Braham's case, unforeseen deleterious results could expose researchers to ruinous law suits.

"We can run this risk," Dr. Braham said. "Or we can abandon intellectual honesty, put derogatory information in the classified safe, and only publish favorable results. Or we can grind to a halt until this liability question is taken care of."

It seems absurd that, after years of frustration due to the atmosphere's complexity and with progress at last being made, the weather changers should find themselves face to face with this agonizing set of choices.

Robert C. Cowen, '49, is Science Editor of *The Christian Science Monitor*.



Of Many Books

Of making many books, we were told long ago, there is no end. It is still true. Once again, therefore, a number of books will be discussed briefly, to serve as the closing engagement of the season, another skirmish in the battle against dusty oblivion.

The Arts and Literature

In *Kiss Kiss Bang Bang* (Boston: Atlantic-Little, Brown, 404 pp., \$7.95) Pauline Kael writes about movies. The words of the title, which she saw on an Italian poster, "are perhaps the briefest statement imaginable of the basic appeal of movies." She knows that movies can have deeper and more subtle appeals. She takes the medium seriously, but she hardly ever calls it cinema. She is always aware of the social matrix in which movies exist, but she distinguishes between aesthetic and sociological judgments. Her critical intelligence finds expression in precise, yet felicitously easy language that often asks to be read aloud. Of special interest are reviews of some current movies, a long article on the making of *The Group*, and a section of Notes (a paragraph to a page in length) on 280 Movies.

It is not clear why *Fifty Works of English Literature We Could Do Without* (New York: Stein and Day, 150 pp., \$4.95) required three authors—the novelist Brigid Brophy, Michael Levey, her husband, and Charles Osborne. The selections range from single poems—Gray's *Elegy Written in a Country Churchyard*—to a series of novels, *The Forsyte Saga*. Everyone will find something in the list he can agree to do without. *The Autocrat of the Breakfast Table*, *Lorna Doone*—by all means. But surely not *Hamlet!* Not *Moby Dick* and *Huckleberry Finn*! It might all be dismissed as a frivolous game, name-dropping in reverse, except that the authors present their critical evaluations with clarity and force. It turns out to be very difficult to read the book passively. The reader is engaged in a running argument in which he is impelled to re-examine and justify his own views. This is a useful, sometimes chastening, experience.

It would be unwise to argue with *The*

Oxford Companion to English Literature (London: Oxford University Press, 961 pp., \$12.50) by Paul Harvey, revised by Dorothy Eagle, which deals with facts, not judgments. This latest edition, the fourth, brings the Twentieth Century entries up to date. It should be noted that of American authors only those most familiar in Great Britain are included. (Contemporary playwrights fare better than novelists. Arthur Miller and Tennessee Williams are in, but Norman Mailer, Saul Bellow, and Truman Capote are not.) This compendium of information about authors and their works, about characters, places, and dozens of other categories of literary significance, is a most valuable companion to readers and writers.

Since the second decade of this century, the magazine *Poetry* has served as both guide and supporter of contemporary trends in American and British poetry. A fiftieth anniversary issue, October-November, 1962, contained poems by the best and best known poets in the United States and Great Britain. Among them were Conrad Aiken, Louise Bogan, E. E. Cummings, Robert Frost, Stanley Kunitz, Ezra Pound, Stephen Spender, William Carlos Williams, and many others—a total of 57. Within a month of publication, the entire edition of 12,000 copies was sold. The special issue has been reprinted as *Poetry: The Golden Anniversary Issue* (Chicago: University of Chicago Press, 143 pp., paper, \$1.95) edited by Henry Rago. It is an outstanding anthology of contemporary poetry.

Of Science and Scientists

Max Born, Nobel Laureate in Physics for his work in quantum mechanics, calls his book *My Life and My Views* (New York: Scribner, 216 pp., \$4.95). About his life, he tells us in three short chapters how he became a physicist, what he did as a physicist, and what science has meant for him. In reflecting on his past, he notes how "achievement and success in life depend to a considerable degree on good fortune. I was fortunate in regard to my parents, my wife, my children, my teachers, my pupils, and my collaborators. I was fortunate in surviving two world wars

and several revolutions, among them Hitler's, which was most dangerous for a German Jew." This true and poignant commentary on the human situation reminded me, by extreme contrast, of the self-satisfied, self-sufficient opportunism revealed in James D. Watson's account of his scientific adventures in the helical DNA jungle.

In much of his book, Dr. Born is concerned with the prevalence of force and violence in human history and the threat of total destruction in the future. He concludes that there is still hope, that we *must* hope, for "in the coexistence of people . . . hope is a moving force."

The man from whose clutching fingers Watson, according to his own story, slipped a Nobel Prize, was Linus Pauling—who nevertheless was able to hold on to two others, for chemistry in 1954 and the Peace Prize in 1962. It is interesting that Pauling, like Born, is keenly aware of the role of chance in life, stating, for example, that he had "the greatest good luck in having gone to (Cal Tech in) Pasadena in 1922."

Structural Chemistry and Molecular Biology (San Francisco: Freeman, 907 pp., \$10), edited by Dr. Alexander Rich, Professor of Biophysics at M.I.T. and Norman Davidson of Cal Tech, is "A volume dedicated to Linus Pauling by his students, colleagues, and friends" for his 65th birthday.

Except for the first chapter, which summarizes Pauling's scientific work, and the last, which is a reprint of his 1931 article, "The Nature of the Chemical Bond," the essays are mainly original papers or surveys in the fields in which Pauling has been a pioneer—proteins, nucleic acids, molecular biology, and chemical theory. Not included are essays on his controversial public life outside of science.

There is an extensive bibliography of Pauling's scientific publications, but no index. There are few opportunities these days to note that a handsome, well-made book, such as this, is reasonably priced.

Fiction for Summer Reading

In the summer of 1831, Nat Turner organized and led a revolt of slaves in the Tidewater region of Virginia. The rebellion was doomed from the beginning, but before it ended with the blood of blacks and whites, with the ceremonial prejudged trial and the hanging of the survivors, the entire South shook with fear and rage. William Styron, himself a Virginian, has written *The Confessions of Nat Turner* (New York: Random, 428 pp., \$6.95) freely based on a pamphlet of the same title published in 1832. The novel is a major work. The story moves inevitably, almost unbearably, to the ordained culmination. Nat Turner is shown as a complex man, proud and confused, confident of divine inspiration, confounded by human limitations, destroyed by the events in which he was the prime force. Other characters, white and black, are minor, but none is a stereotype, all are subject to inescapable ambivalences of motive and action.

Mr. Styron's courage in choosing such a theme at this stage of history is a measure of his commitment as an artist. But although the novel has been awarded a Pulitzer Prize and is a best seller, it seems to me that Mr. Styron must expect to be disappointed in its reception. Surely it should not be judged as a political, or even a personal, statement on a contemporary social problem. Yet despite one's intention, how can it be felt, given the crisis in society, purely as a literary work of art?

William Herrick has chosen a smaller, more private world for his novel, *Strayhorn* (New York: McGraw-Hill, 176 pp., \$4.95). It is the story of a search by David Strayhorn less for a way of life than for purpose in living at all. Place, time, secondary characters are portrayed in vivid flashes, but the real setting is internal. The only other person is Madeleine Dearing, an opera singer grown so huge that her flesh has swallowed up her voice. Although the attraction that brings them together is not made entirely clear, they battle, hate, and serve each other in a relationship that eventually yields peace of a sort.

Strayhorn is more ambitious and freer, in both subject and style, than Mr. Herrick's first novel, *The Itinerant*. He writes with involvement and intensity which, to his credit, is in marked contrast to the currently fashionable style of a cool detachment.

The Cassiopeia Affair (Garden City: Doubleday, 235 pp., \$4.50) by Chloe Zerwick and Harrison Brown, the noted geochemist, starts like science fiction with the receipt one "early morning in the late 1900's" of a communication from a planet in the vicinity of Cassiopeia. The message is quickly deciphered by Dr. Max Gaby and his staff at the Redo Valley observatory, where radio and optical telescopes differ

from those of the primitive 1960's only in size. Urged by Dr. Gaby, the President of the United States uses this contact with intelligent life from outer space to support one more plea to the world to end conflict and unite. Science fiction is abandoned and the authors turn to the politics of war and peace. The story includes a little sex, a love interest, intrigue, and plot complications involving paper-thin characters engaged in awkward dialogues.

It is easy enough to say that this is a bad novel and let it go. But Harrison Brown is a scientist of repute who probably has been, and perhaps will be, an adviser to government officials. His views (I assume that Miss Zerwick is the literary expert of the team) on the nature of democratic society and processes, on relationships among nations and among men, are therefore worth pondering. For example, United States senators may be good or bad. There are, however, only two bad scientists in the book: one who never finished his training, and another who left scientific work for administration. All others are good, for reasons implied in Dr. Gaby's response to an accusation at a Congressional hearing. " 'About truth I do not need instructions, I suppose,' Gaby said loudly. 'It is the essence of my profession. Can you say the same for yours, Senator?' "

New from the M.I.T. Community

Finite-State Models for Logical Machines, Frederick C. Hennie, '55, Associate Professor of Electrical Engineering, M.I.T. New York, London and Sydney: John Wiley and Sons, Inc., \$18.50. An introduction to the abstract models useful for representing such physical systems as sequential switching circuits and iterative arrays.

Recent Progress in Applied Mechanics, edited by Bertram Broberg, Jan A. Hult, Sc.D.'57, and Frithiof Nordin. New York, London and Sydney: John Wiley and Sons, \$15. Thirty-three papers in various fields of applied mechanics, selected to cover many different aspects of this rapidly expanding field of knowledge. The contents include contributions by Ulf B. Edstam, S.M. '55, Eric Reissner, Ph.D.'38, Professor of Applied Mathematics at M.I.T., and Frederic Y. Wan, '59, Assistant Professor of Applied Mathematics.

Conversational Computers, William D. Orr, Editor. New York, London and Sydney: John Wiley & Sons, Inc. A nontechnical status report on development of interactive, responsive computers for on-line problem-solving, and their potential effects for technological and social systems. There are chapters by Vannevar Bush, Eng.D.'16, Honorary Chairman of the M.I.T. Corporation, and Joseph J. Gal, '58, Vice President of White, Weld and Company, Inc.

The Human Mind, edited by John D. Roslansky. Amsterdam: North-Holland

Publishing Company, \$5. A summary of the 1967 Nobel Conference of Gustavus Adolphus College, including chapters by Huston Smith, Professor of Philosophy, M.I.T. ("Human vs. Artificial Intelligence") and Francis O. Schmitt, Institute Professor (Biology) M.I.T. ("Molecular Parameters in Brain Function").

General Virology (second edition), Salvador E. Luria, Sedgwick Professor of Biology, M.I.T., and J. E. Darnell, Jr. New York: John Wiley and Sons, Inc., \$12.50. A summary of general virology, covering all parts of virology and virus research from the point of view of the biologist.

Knowledge and the Future of Man, Walter J. Ong, S. J., Editor. New York, Chicago, and San Francisco: Holt, Rinehart and Winston, \$7.95. The proceedings of an international symposium (for the 150th anniversary of St. Louis University) on the significance of man's increasing knowledge of the future evolution of humanity; includes "Art for a Changing Scale" by Gyorgy Kepes, Professor of Visual Design, M.I.T., and "The Spirit of Science and Moral Involvement" by Jerrold R. Zacharias, Institute Professor (Physics), M.I.T.

Disarmament and Arms Control, Lincoln P. Bloomfield, Professor of Political Science, M.I.T. New York: Foreign Policy Association (Headline Series No. 187), 85¢. While many recognize that the nuclear arms race increasingly risks universal disaster, nothing has been done that can be considered "genuine progress toward disarmament."

Annals of the IQSY; Volume 1: Geophysical Measurements—Techniques, Observational Schedules and Treatment of Data. Cambridge and London: The M.I.T. Press. The first volume in a series presenting the scientific results from the study of solar space conducted throughout the world during the International Year of the Quiet Sun, 1964-1965.

Cohomology Operations and Applications in Homotopy Theory, Robert E. Mosher, Ph.D. '62, and Martin C. Tangora. New York: Harper and Row, \$12.95. A textbook on the theory and application of cohomology operations, intended for advanced topology students.

The Temporary Society, Warren G. Bennis, Ph.D.'55, and Philip E. Slater. New York, Evanston and London: Harper and Row, \$4.95. How the accelerating rate of change in modern life is eroding authority in both business and family organization (see *Technology Review*, Apr., 1968, pp. 36 ff.)

Advanced Mathematics for Engineers, Shikao Ikehara, '28, and Kaoru Tanaka. Tokyo: Gakujitsutosho Shuppan. A Japanese-language text for use by engineering students.

You're Next on the List, David O. Woodbury, '21. Boston and Los Angeles:

Western Islands, Publishers, \$1. A satire on modern bureaucracy, set in the town of Ludley, Mass., and involving the fictional engineering university Eastern Technological Institute on the banks of the Charles River.

Separation Techniques in Chemistry and Biochemistry, edited by Roy A. Keller. New York: Marcel Dekker, \$12.75. Proceedings of the 19th Annual Summer Symposium on Analytical Chemistry at the University of Alberta; includes a chapter on solvent sublimation: extraction of methyl orange and rhodamine B by Barry L. Karger, '60, A. B. Caragay, and S. B. Lee.

EDUNET: Report of the Summer Study on Information Networks, George W. Brown, James G. Miller, and Thomas A. Keenan, Editors. New York: John Wiley & Sons, Inc. A proposal for an interuniversity network of computer facilities, the report of a summer conference study (1966) in which the participants included the late Samuel N. Alexander, S.M.'33, Ward J. Haas, '43, Manfred Kochen, '50, J. C. R. Licklider, Professor of Electrical Engineering at M.I.T., Oliver G. Selfridge, '45, of the M.I.T. Lincoln Laboratory, and Robert S. Taylor, Ph.D.'23.

The New City: Architecture and Urban Renewal, Elizabeth Kessler, Sidney J. Frigand and Arthur Drexler. New York: Museum of Modern Art, \$1.95. Faculty teams from four universities commissioned by the Museum of Modern Art propose new housing, new waterfront developments, and transformation of liabilities to assets in four areas of Manhattan. The volume includes a proposal by an M.I.T. team (Stanford O. Anderson, Assistant Professor of the History of Architecture; Robert Goodman, '60, Assistant Professor of Architecture; and Henry A. Millon, Associate Professor of the History of Architecture) for development of a major community resource in the East Harlem-South Bronx area at the northeast corner of Manhattan Island.

Halsey's Typhoons, Hans Christian Adamson and George F. Kosco, S.M.'40. New York: Crown Publishers, Inc., \$4.95. A highly readable firsthand account of how two typhoons, more powerful than the Japanese, dealt death and destruction to Admiral William F. Halsey's Third Fleet in the Pacific in 1944 and 1945.

SNOBOL3 Primer—An Introduction to the Computer Programming Language, Allen Forte, Professor of Music, M.I.T. Cambridge and London: The M.I.T. Press, \$3.95. A primer by which novices can learn the computer programming language SNOBOL3, designed by Professor Forte for workers in the humanities and social sciences who need to use a computer for research purposes.

Stochastic Approximation and Nonlinear Regression, Arthur E. Albert, '56, and Leland A. Gardner, Jr. Cambridge:

The M.I.T. Press, \$16.50. The problem of "real-time" curve fitting in the presence of noise, from the computational and statistical viewpoints, focusing on estimator sequences of the so-called differential correction type.

Tensile Structures. Volume 1: Pneumatic Structures, Frei Otto, Editor. Cambridge and London: The M.I.T. Press, \$22.50. The design, structure, and calculation of structures consisting to a large extent of tensile components, such as cables, nets, or membranes.

Physical-Distribution Systems, John F. Magee, '51. New York: McGraw Hill Book Company, \$5.95 (also paper, \$3.50). An introduction for students of marketing to the concept of a physical-distribution system and the elements of which it is composed, including the information necessary to its effective design and management.

Modal Approximations: Theory and an Application to Reactor Physics, Weston M. Stacey, Jr., Ph.D.'66. Cambridge: The M.I.T. Press, \$6.00. A monograph which codifies a general formalism for obtaining mathematically tractable approximations to multivariable systems by means of modal expansions.

Computer Simulation of Competitive Market Response, Arnold E. Amstutz, '58. Cambridge and London: The M.I.T. Press, \$17.95. A comprehensive behavioral theory of market interactions and an approach to policy management based on the use of microanalytic computer simulation.

Wings in the Meadow, Joe Brewer, illustrated by Henry B. Kane, '24. Boston: Houghton Mifflin Company, \$4.95. The life cycle of the monarch butterfly, told as the life of a single specimen through birth, metamorphosis, and death. The meticulous illustrations give the book special interest for members of the M.I.T. community.

Modern Composite Materials, Lawrence J. Broutman, '59, and Richard H. Krock, '59, Editors. Reading: Addison-Wesley Publishing Company, 1967. A general review of composite materials from fundamental principles to state-of-the-art research and technology. Among the chapter authors are Allan S. Bufferd, '59; Richard W. Hertzberg, S.M.'61; Edward M. Krokosky, '58; Peter T. Shaffer, '51; and Robert A. Signorelli, '50.

The Urgent Future: People—Housing—City—Region, Albert Mayer, '19. New York: McGraw Hill Book Company, Inc., \$16.50. All elements of the current urban crisis, from the home and community to regional and national levels, considered as a continuum to which vast changes in organization, management and use are proposed.

Mechanism of Graphite Formation, John F. Wallace, '41. Cleveland: Malleable Founders Society, \$3.50. Discussion and

detailed analysis of various theories of graphite behavior in liquid and solid state and in gray, ductile and malleable cast iron.

The Political Cultures of Massachusetts, Edgar Litt. Cambridge and London: The M.I.T. Press, \$5.95. An analytical and historical assessment of Massachusetts politics, relating changes in the political dynamics of the state with the cultural changes in both state and nation that impinge upon it.

Temperature Control, Myer P. Kutz, '59. New York: John Wiley and Sons, Inc., \$10.95. The principles of analysis and synthesis of temperature-control problems and their solutions, various heat transfer methods and primary devices for controlling heating and cooling, and thermal design aspects of temperature-control problems.

Recent Progress in Applied Mechanics, edited by B. Brobert, F. Niordson, and Jan A. H. Hult, Sc.D.'57. New York: John Wiley and Sons, Inc., \$15. New research problems and research results summarized in 33 articles by workers in the field of applied mechanics.

Control Instrument Mechanisms, John E. Warren, '46. Indianapolis: Howard W. Sams and Company, Inc., \$8.95. A review of the mechanical and pneumatic principles that govern the components of all pneumatic control instrumentation.

The Science of Art, Robert E. Mueller, '48. New York: John Day Company. A study of the interaction between science and art, the relationship of cybernetics to art, how the complex meanings of art are in fact communicated, and how science and technology have affected both artistic vision and the media used to express it.

Scientific Values and Human Values, Edward and Elizabeth Hutchings, Editors. New York: American Elsevier Publishing Company, Inc., \$7.50. Proceedings of the conference on scientific progress and human values on the occasion of the 75th anniversary of the California Institute of Technology (see *Technology Review*, Jan., 1967 pp. 46-48). The authors include Murray Gell-Mann, Ph.D.'51, and Robert L. Sinsheimer, '41.

Joseph Mindel is a member of the M.I.T. Lincoln Laboratory. He was formerly a teacher, department head, and administrator of science education in the New York City secondary schools. He has written on science education and the history of science and is the author of many radio and television plays. The notes "New from the M.I.T. Community" have been prepared by the editors of *Technology Review*.

Are the Russians Laughing Up Their Sleeves?

Things are far from happy along Route 128, Greater Boston's "research alley." In fact, this is rapidly becoming the most unhappy period in the so-called Golden Circle's short but eventful life. The source of disenchantment is the war in Vietnam and the effect which that conflict is having upon research and development funds, the lifeblood of most Route 128 companies. Quite simply, the cash for tomorrow's technology has been diverted to today's war.

"This is an alarming fact," commented the board chairman of one of Route 128's more esoteric companies. "It means that the United States may be forfeiting its technological supremacy. If the Communists had planned the whole thing, they couldn't have undermined our basic research effort more successfully than by keeping us mired down in Vietnam."

Signs of Atrophy

These and similar comments, repeating the same general argument about the state of things in the business world of Research and Development, are something of a barometer of the feeling in the Research and Development community. They reflect considerable unease. Signs of atrophy are already evident in a few companies that have traditionally been heavily dependent upon Washington's Research and Development money. As more and more funds are diverted into hardware that can be used in conventional war and away from research and exploratory development projects, some companies have been quietly trimming their work forces. The results would have been more noticeable but for The Raytheon Company, one of Massachusetts' largest employers, which for some time has been in a hiring mood due to some war-oriented projects and the fact that its business generally is booming.

The research, development, test and evaluation budget of the Department of Defense for fiscal 1969 is a bit more than \$8 billion, up about \$616 million from the current year. But in fiscal 1966 the Research and Development budget was pegged at \$6.9 billion, which means that it is not even keeping pace with in-

flation. The \$616 million increase for 1969, *Electronic News* notes "merely represents a restoration of funds that were denied in the current fiscal year. Though the dollar total is substantial, there is little by way of large new programs, and high administration officials agree that the Research and Development segment of the budget is austere."

It may also be misleading, Route 128 observers say. Behind those budget figures is the built-in flexibility called "reprogramming" which allows the Department of Defense to transfer funds from one pocket to another. The result is often that longer term research projects are shelved and the funds redirected toward getting hardware operational in a hurry. The beauty of this built-in shell game is that the amount of funding involved is not made public and consequently is hard to determine.

Undermining Our Pre-eminence

As more and more projects are delayed or deferred, the harder-hit Route 128 companies are trying frantically to switch to other programs not tied to Department of Defense apron strings. In some cases it is proving difficult.

"Such shifts take time because of the nature of facilities and of the people involved," an engineer-businessman has told me. "One thing I know. Some good research teams are being broken up around these parts." Many companies are ploughing back profits to fill the vacuum left by Department of Defense funding. Earnings are bound to suffer. A number of firms are "retrenching"—a polite way of saying that employment and overhead are being cut to the bone.

There are other consequences, too. Changes in the draft regulations may rob industry of some of its brightest young graduates. Some may never return. How can one calculate such a loss to the nation's technology?

As money becomes tight, companies are showing increasing reluctance to underwrite continuing education for their scientists and engineers. This has become apparent at Northeastern

University, according to Israel Katz, Dean of the Center for Continuing Education. He reported a "sudden drop" in enrollment for the second term of the current academic year, attributed to the fact that companies are finding it more difficult to charge off the expense of further education as part of the overhead in advanced development programs. Again, who can tell what effect this sort of thing will have upon America's technological pre-eminence?

Are They Hurting, Too?

Technological pre-eminence is not, however, something about which the average American is deeply concerned. The treasurer of a Route 128 company complains that "the nation is fairly oblivious. Nobody seems to be paying any serious attention." The apathy is probably because research and its fruits are hard to relate to human affairs. "It's like asking how many lives will be lost 10 years from now because of medical research that has been shelved," the founder of a Greater Boston research firm said.

The evidence is overwhelming along Route 128 that things are amiss. It is not crocodile tears over blue-sky projects that have been axed; there is genuine apprehension about hard-core programs that have suddenly been discontinued. "It is no longer merely blood-letting—they are down to muscle and bone now," one executive told me.

Are the Russians laughing? Is Vietnam giving them their chance to overtake the U.S. in across-the-board technological achievement? Perhaps, but it may just be that they have the same set of problems. As a Route 128 scientist-turned-businessman put it, "I sit here at my desk sometimes and wonder if they aren't hurting, too."

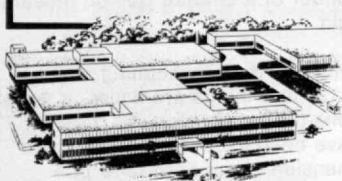
Donald White is a member of the Boston *Globe* editorial staff specializing in coverage of technologically based industry in the Greater Boston area.



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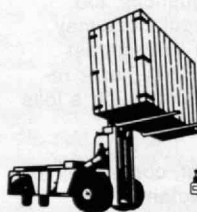
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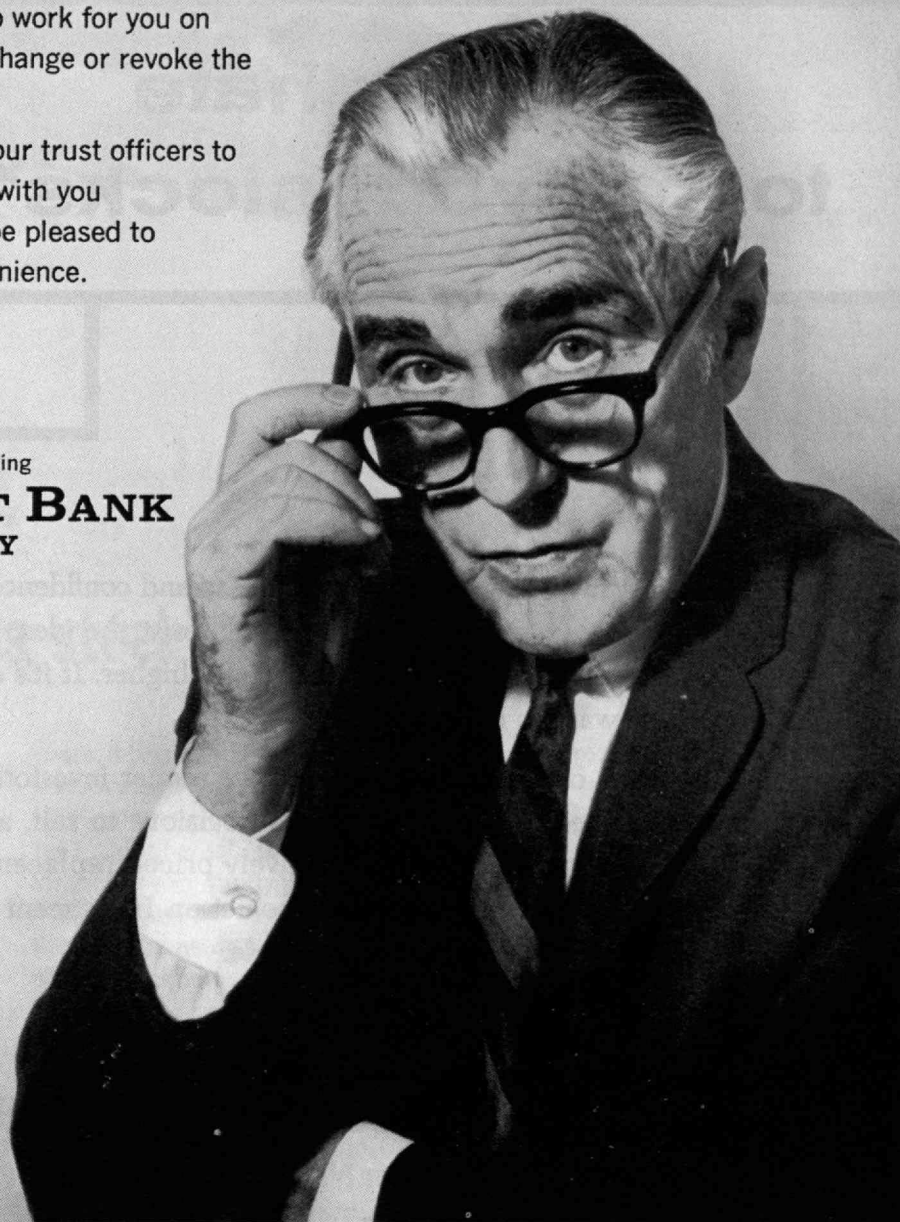
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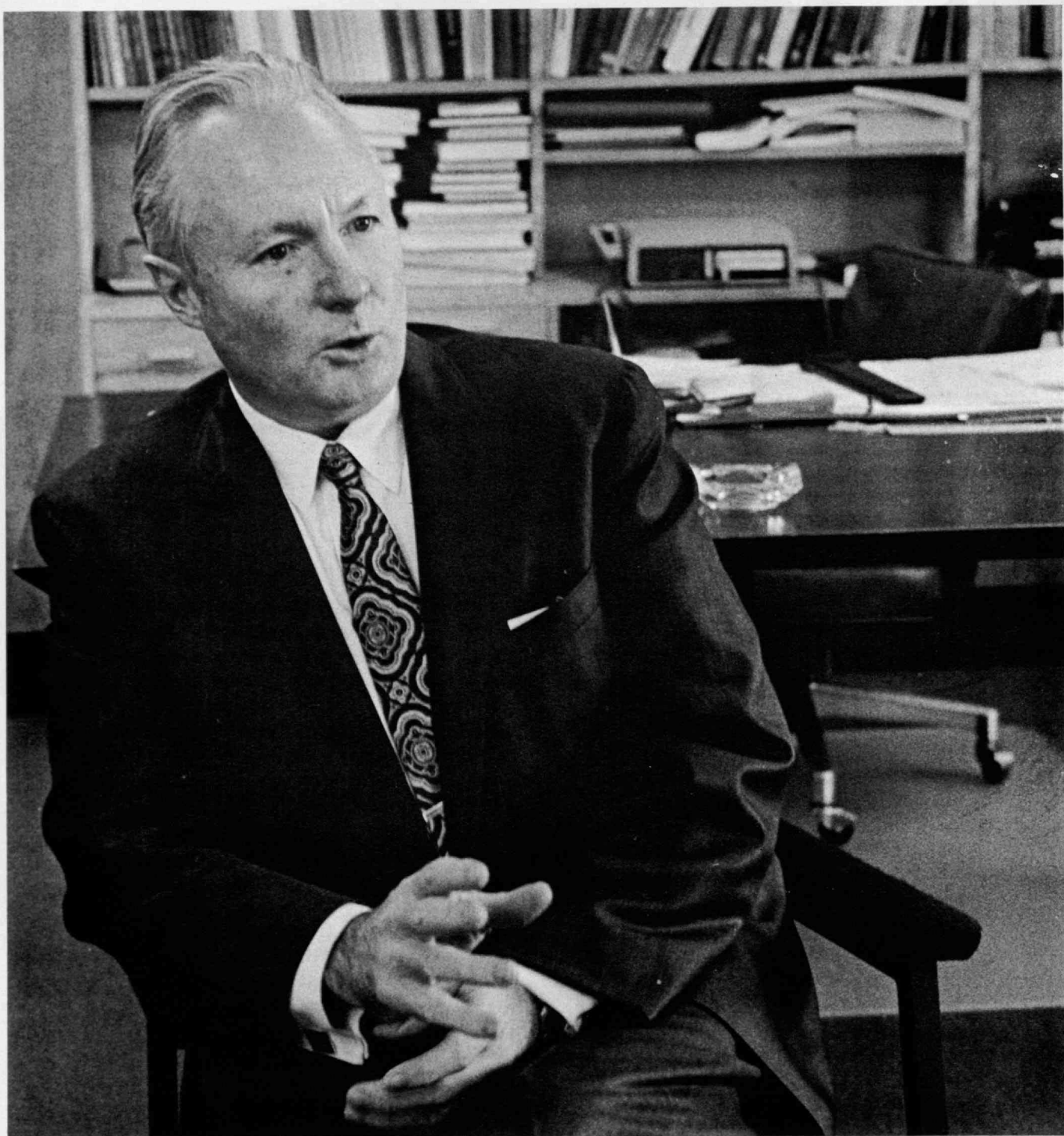
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John F. Collins

Technology for the Urban Crisis

If the year 2000 seems to be shrouded in the kindly mists of distance, somehow the concern of someone else, consider some statistics: Our population in 1966 was 197 million; in just 12 years, in 1980 the U.S. will have become a nation of 250 million.

By 1980 75 per cent of our people will reside in urban areas. There will be 165 cities with a population of 100,000 or more, compared with 100 in 1960. There will be twice as many metropolitan areas with over one million population; the New York metropolis alone will claim 20 million inhabitants. The gross national product will increase from \$504 billion to \$1,060 billion in 1980. The number of automobiles in use will rise from 59 million in 1960 to slightly above 120 million in 1980.

These figures suggest the scope of our future urban problems. We all feel something of the urgency of our present ones. Sprawling urban growth, delinquency, racial tensions, transportation accidents and congestion, and air and water pollution are only some of the issues. Clearly, within this century the great test of our nation will be the maintenance of quality in our lives, in the face of this rapid rise in population and the increasing demands of affluence and mobility.

There are encouraging signs that we are beginning to confront this issue squarely and honestly. The American Bar Association has recently appointed for the first time in the Bar Association's history a special national committee on housing and development law; that committee will make recommendations about the role which lawyers can play in solving some of these human problems. The Urban Coalition, which has been formed on both national and local levels, will bring business, labor, civil rights leaders, religious leaders, and indeed every element in American society together, to explore the problems which each one has heretofore seen only from his own special point of view.

There has been in the past few months a reawakening of the national conscience. There is now an

awareness that we have not done our job adequately—that it is not appropriate in this time of affluence for so many of our people to live in grossly inadequate housing, to be deprived of suitable recreation, to be denied the educational opportunity to become productive members of our society. All these things may properly be construed as meaningful manifestations of hope amidst monumental problems.

The significance of this change in our national climate goes far beyond the new jobs which have been created for this summer, and far beyond the plans which can be implemented over the next two or three years. Rather, I think, it is evidence that the citizens of America have finally recognized that the business of running our cities cannot properly be left to the random operation of the political process. I am perfectly prepared to say on behalf of the public sector that we have done a something less-than-adequate job of making the cities of this country the sort of heritage we would like to turn over to the next generation. Now America is beginning to understand that the only way in which we can do a demonstrably better job by 1980 is for every element of society to help, and now.

By way of preface, let us ask ourselves a few questions: Are our cities and states adequately organized to deal with the problems of today, let alone of 1980? Can our welfare system do more than support people in a continuing state of dependency? Can building codes and practices be modernized to reduce housing costs? Why have we failed to remove the obstacles to the penetration into our environment of modern technology?

Consider, for example, the question of removing the constraints to the application to our urban environment of improved technology. Or to put it another way, how can we as a nation contemplate such sophisticated scientific and industrial goals as the conquest of space and yet make such a relatively insignificant contribution to the improve-

Technology for the Urban Crisis

ment of the environment in which we live? How is it that we still build a sewer system exactly the way the Pilgrims did when they stepped off Plymouth Rock, when they dug a ditch and dropped in a hollow log? We are still disposing of refuse as our ancestors did 150 years ago: we're burying it or we're burning it, and we are not doing either one particularly well. There must be within our collective technological capacity a scientific, automated and economically realistic way to deal with solid waste—to separate the 65 per cent of refuse which is paper and pump that back into our economy through the pulp and cardboard business, to separate the metal and return it to industry, to grind the glass, and to compost the rest.

I have participated in many discussions in many different places about what is required to remake a city; there is no unanimity of opinion on that subject. But I have never encountered one man who feels that we have too many weapons. There are 416 categorical aid programs by which the federal government endeavors to be of assistance to states and cities. It is now incumbent on us to reorganize these many programs along functional lines. Political boundaries must be adapted so that they accomplish their role of keeping government close to people without obstructing better education, more efficient law enforcement, and more equitable distribution of welfare burdens. When this is accomplished, we can ask each metropolitan region to plan its future in detail, and to have that plan approved by all the people. With such planning completed, we will be able to propose a program of unallocated federal funds to cities to be spent entirely on the basis of local decision and local priorities, without suggestion or dictation from anywhere, subject only to the check of a post-audit to insure that the funds were in fact expended in accordance with the plan.

In approaching today's problems the states, with few exceptions, have manifested all of the mobility of the stagecoach, all of the creativity of the dinosaur. The federal government, on the other

hand, with all of the problems confronting it, both foreign and domestic, has indeed made progress in this decade—not as much as we might like, but a hopeful beginning. The Model Cities Program at least holds promise for testing systems engineering and problem-solving capacity on our urban problems. Now we must find a workable, profit-oriented mechanism by which the great talents of systems-oriented industry can be brought to bear on the needs of society in our cities. This same mechanism must aid in the creation of new cities, perhaps in reasonable proximity to old ones. The older cities could be given a voice in the planning, the populating, and the financing of the nearly new, so that the new will not be new and prosperous and the existing cities continue to be old and inhabited only by the underemployed, the undereducated and the underprivileged. Studies, research, systems analysis of urban problems on a collective basis and an interdisciplinary assault by every element of the nation—public and private, academicians, business, labor, civil rights . . . all of these are required.

The fact is that until recently, very little has been done in the universities and in the private sector to improve the environment in which 75 per cent of Americans will soon be living, and the reason for this neglect is finally becoming apparent: no one has been able to speak for the urban dweller, the ultimate customer, the consumer, the client. No one has been able to certify to a corporate entity that there can be profit in terms of salable products from research on urban-related issues. While we are at last taking this new and introspective look at ourselves, we are making an opportunity to create a new entity, an innovative means for private enterprise to realize the involvement it seeks in solving the great issue of our time.

I visualize the creation of a public-private corporate entity, with policy representation including the federal government, the nation's mayors, the nation's governors, and the private sector. Into this organization can be channeled funds from the public sector and the private sector, to be used by

Having completed his second term as Mayor of Boston in January, John F. Collins began a new career as Visiting Professor of Urban Affairs at M.I.T. In the seven months since then he has been sharing with the Institute's students, faculty, and alumni his experience in a broad range of urban problems and his views of the responses which America's cities must make to the challenges now before them.

Closing the Ring



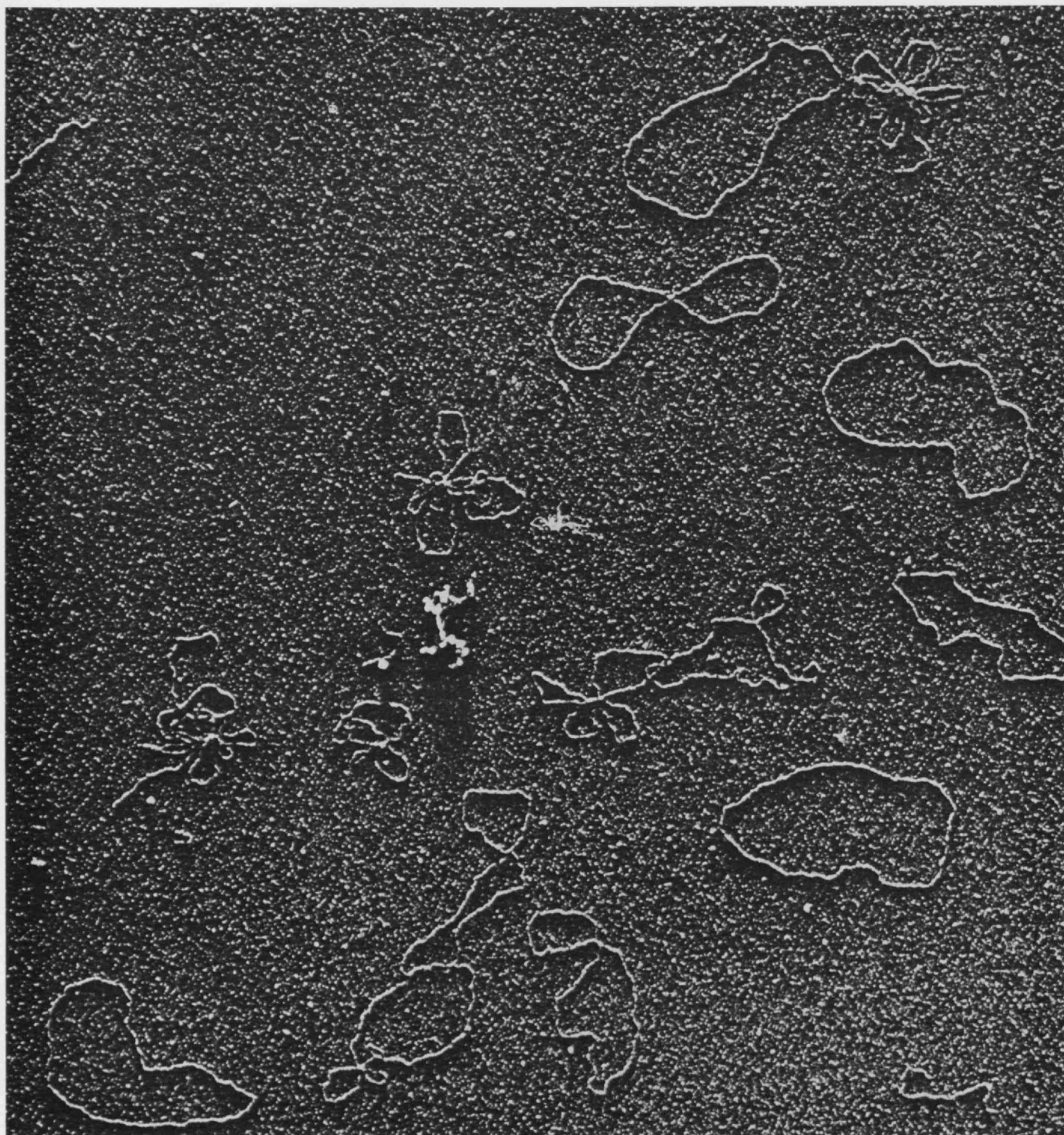
the corporation in a joint effort to identify the tasks, to reorder the priorities, and to develop plans to which the private sector can bring its systems analysis, mission-oriented problem solving potential. Think, if you will, of the number of customers that such an enterprise would have if it were able to look back at 12 months of research and advertise a new systems-oriented way to dispose of refuse. Imagine that in addition it could offer to do any one of a dozen things in the litany of unmet urban needs, while perhaps through a licensing arrangement create a revolving research fund and so make possible honorable profit and improvement of our urban environment simultaneously. Cannot we bring just a fraction of our scientific management, and enterprise capacity, to bear in such a way as this on the problems of the city?

If, however, we persist in our comfortable, traditional enclaves of thought and endeavor, we will see 1980 approach in an atmosphere of discontent

and despair—and possibly worse. But if the objectives of a better life for urban dwellers are really ours, if we reject the efforts of grandstand quarterbacks, noninvolved experts, faculty club problem-solvers who love to solve problems that they think exist instead of coming to grips with the ones that actually exist—if we really resolve that there is a generation coming along in our cities who deserve better than we've left for them, then 1980 and 2000 will be years of triumph.

During his two terms as Mayor of Boston, John F. Collins became widely honored as one of the nation's most progressive and farseeing municipal administrators. He is now Visiting Professor of Urban Affairs at M.I.T.

Electron micrograph showing DNA rings from bacteriophage ϕ X174, magnification approximately 70,000. (Photo: H. Fernandez-Moran)



The history and the meaning of one of the great achievements of the life sciences, as told by one of the principal participants

Robert L. Sinsheimer, '41

Closing the Ring

Last December, newspaper headlines and television newscasts informed the world that for the first time an infective DNA molecule—the nucleic acid core of a virus—had been successfully synthesized in a test tube. This scientific milestone, a two-day wonder in the news media, was of course the destination of a long trail of scientific research—the culmination of a long series of experiments with repeated trials and failures while the understanding essential for success was arduously acquired.

Where did this trail begin and what was its course?

Where do the threads of any scientific research begin? Where does a river start? But looking backward there is a point in time at which one can recognize that a particular line of scientific endeavor has indeed surely begun. In this case there were two lines—destined ultimately to merge in the final synthesis.

One was the study of the enzymology of DNA synthesis—the central theme of the laboratory of Dr. Arthur Kornberg at Stanford University since 1955. The other was the analysis of the structure and mode of replication of an extraordinary bacterial virus, ϕ X174—the central theme of my laboratory at the California Institute of Technology since 1956.

The first tentative contact of these lines came in 1960. But prior to that the Kornberg laboratory had identified, isolated and extensively purified an enzyme in bacterial extracts—DNA polymerase—that, given DNA molecules to prime the reaction and DNA precursors—deoxyribonucleotide 5′—triphosphates—could polymerize these monomeric precursors into long-chain polynucleotides in patterns apparently directed by the DNA chosen as a primer. The enzyme synthesized polynucleotides in considerable excess to those added as the primer. Either a single polynucleotide chain or the more common double polynucleotide helix could serve as primer.

A First Synthesis Effort

DNA is the genetic component of many viruses and all cells. In favorable systems it is possible directly to demonstrate the genetic activity of the DNA. In one instance, the addition of an appropriate DNA to competent bacterial cells can change their genetic constitution. The DNA can be incorporated and provide new, inheritable properties and thus “transform” the cells. In another instance, free viral DNA can, under appropriate conditions, penetrate cells and initiate a complete virus infection giving rise to complete progeny virus particles.

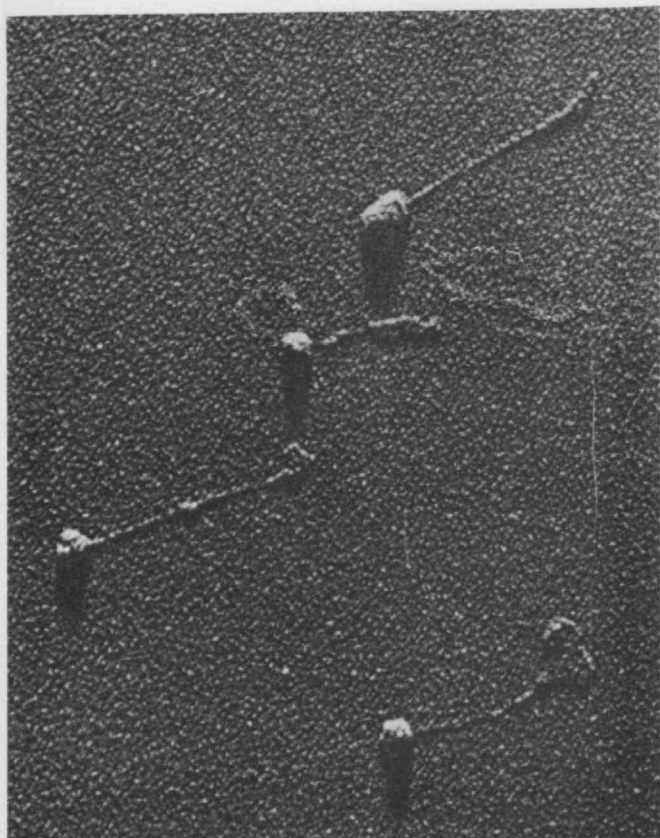
As the DNA made *in vitro* by the polymerase in Dr. Kornberg's laboratory appeared at that time to have physical and chemical properties identical to those of the primer, it was natural to inquire whether the newly synthesized DNA was biologically active; whether, when made with appropriate primers, it could provide heritable factors in a transformation assay or infective DNA in a viral DNA assay.

Prior to 1960 attempts to demonstrate transforming activity of the synthetic DNA had, for unknown reasons, failed. However, it seemed appropriate to attempt, alternatively, the synthesis of a viral DNA capable of infection.

Meanwhile, prior to this time, research in my laboratory had been in progress on the small bacterial virus, ϕ X174. By 1960 we had purified and characterized the virus particle and its nucleic acid. It proved to be the smallest DNA-containing virus known and the first representative of a new class of virus particles in which the genetic element was a single-stranded DNA, containing only 5,500 nucleotides. We had further been able to develop an infectivity assay for the free viral DNA. Under appropriate conditions bacterial spheroplasts were found to be permeable to the DNA. Within the spheroplasts the DNA could initiate and carry out a complete infective cycle.

As this was (and remains) the smallest viral DNA

This electron micrograph made at M.I.T. of bacteriophage ϕ X174 supplied by the author shows the long-chain nucleic acid (DNA) molecules separating under moderate heat treatment. Earlier electron microscopy at M.I.T. had demonstrated ϕ X174 to be the smallest viral DNA known. (Photo: Elizabeth M. Slayter, Ph.D.'60, from Cecil E. Hall, Ph.D.'48)



known and as an infectivity assay was available, it seemed appropriate to attempt to synthesize ϕ X DNA with the polymerase and to ascertain whether the synthetic DNA could be infective.

In a collaboration between Dr. Kornberg's laboratory and ours, such experiments were attempted. Synthetic polynucleotides could be produced with ϕ X DNA as primer, in excess of the viral DNA added. But the product was completely inactive, and indeed the initial infectivity of the primer viral DNA was gradually destroyed in the reaction.

As an additional result, ultracentrifugal studies of the progress of the synthesis indicated that there was a considerable lag in the use of a fraction of the viral DNA as a primer. Indeed this fraction was only gradually brought into the reaction.

The product of the synthetic reaction, as was expected, was a double-stranded DNA, made by synthesizing the complementary strand on the viral DNA and then proceeding to further synthesis of double-stranded DNA.

With such totally negative results it seemed clear that the synthetic process was inadequately understood to permit success and that further fundamental studies were needed.

Infectivity Increases without Synthesis

In the succeeding three years, significant advances were made in both laboratories. At Palo Alto, the polymerase enzyme was more extensively purified and practically all detectable endonuclease (an enzyme which degrades DNA) activity was eliminated. (It might be noted that in so doing the effective synthetic activity of the enzyme with many DNA primers was significantly reduced.)

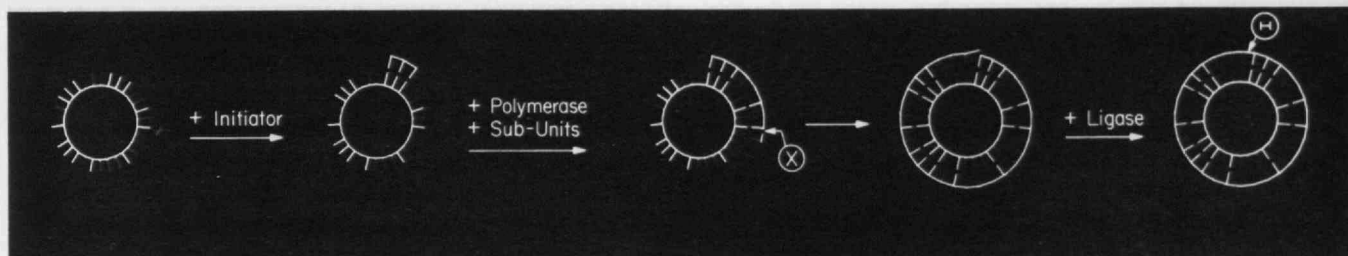
In our laboratory we discovered that the viral nucleic acid when in the virus particle was in fact a ring molecule, without ends—and that, when properly prepared, so was the free viral DNA. The earlier nucleic acid preparations were shown to be mixtures of rings and broken rings. Only the intact rings were infective.

Further we demonstrated that inside the cell the single-stranded viral DNA ring is converted rapidly to a double-stranded DNA ring. These had been isolated and also shown to be infective to bacterial spheroplasts, albeit less so than the viral single-stranded DNA rings.

With these developments it seemed worthwhile by 1963 again to attempt the synthesis of infective viral DNA (the synthesis of active transforming DNA was still unachieved). ϕ X DNA preparations known to be almost entirely composed of rings were used as primer. Initiation of synthesis was now much more uniform. Synthesis with the more purified polymerase was allowed to proceed to various extents up to and exceeding the amount of primer DNA added.

The product was shown to be double-stranded DNA. It was infective. The infectivity was, however, reduced to that of the double-stranded intracellular DNA or somewhat less. Since the DNA contained, within it, the original primer DNA, the infectivity could well be ascribed to this component. When by appropriate procedures the double-stranded product DNA was separated into its constituent strands, only the primer DNA strands were biologically active. The synthetic DNA strands were inert. (The alert reader at this point may question whether one could have expected the synthetic DNA strand—as the complement of the

Sequence of events in the first round of synthesis. An initiator (a small polynucleotide) is added to the viral DNA rings. Nucleotide sub-units are added to the initiator by the polymerase enzyme, as specified by the sequence of the viral DNA. When the growing chain has reached, around the ring, to the origin, the last link is closed by a second enzyme, ligase. The synthetic ring made in this round is complementary to the viral ring. By appropriate means it is separated from the natural viral rings and this complement is then used as the template in a second round of synthesis. The product of the second round, a synthetic ring complementary to the complementary ring produced in the first round, is now identical to the viral DNA ring.



viral DNA—to be infective. At that time the question could not be definitely answered. Three years later it was unequivocally demonstrated that the DNA ring complementary to the ØX viral DNA ring is indeed infective.)

Improvement in the polymerase preparation had by now at least prevented the nuclease destruction of the infectivity of the primer viral DNA. But no active synthetic product had been produced. In light of present knowledge of ØX infection it is probable that the synthetic complementary strands synthesized in these experiments—while unable solely to initiate a complete infection—may have served as correct templates for messenger RNA synthesis.

Back to the laboratory. Subsequent experiments in the Kornberg laboratory now revealed a fundamental defect in the product DNA synthesized *in vitro* by the polymerase from double-stranded DNA templates. Electron micrographs revealed that such DNA's, unlike natural DNA's, were branched, and physical measurements showed that the two strands of such DNA could not in general be separated. As a partial consequence of these results research at Palo Alto shifted in considerable part to work with single-stranded DNA's as primers.

Two Final Hurdles to Success

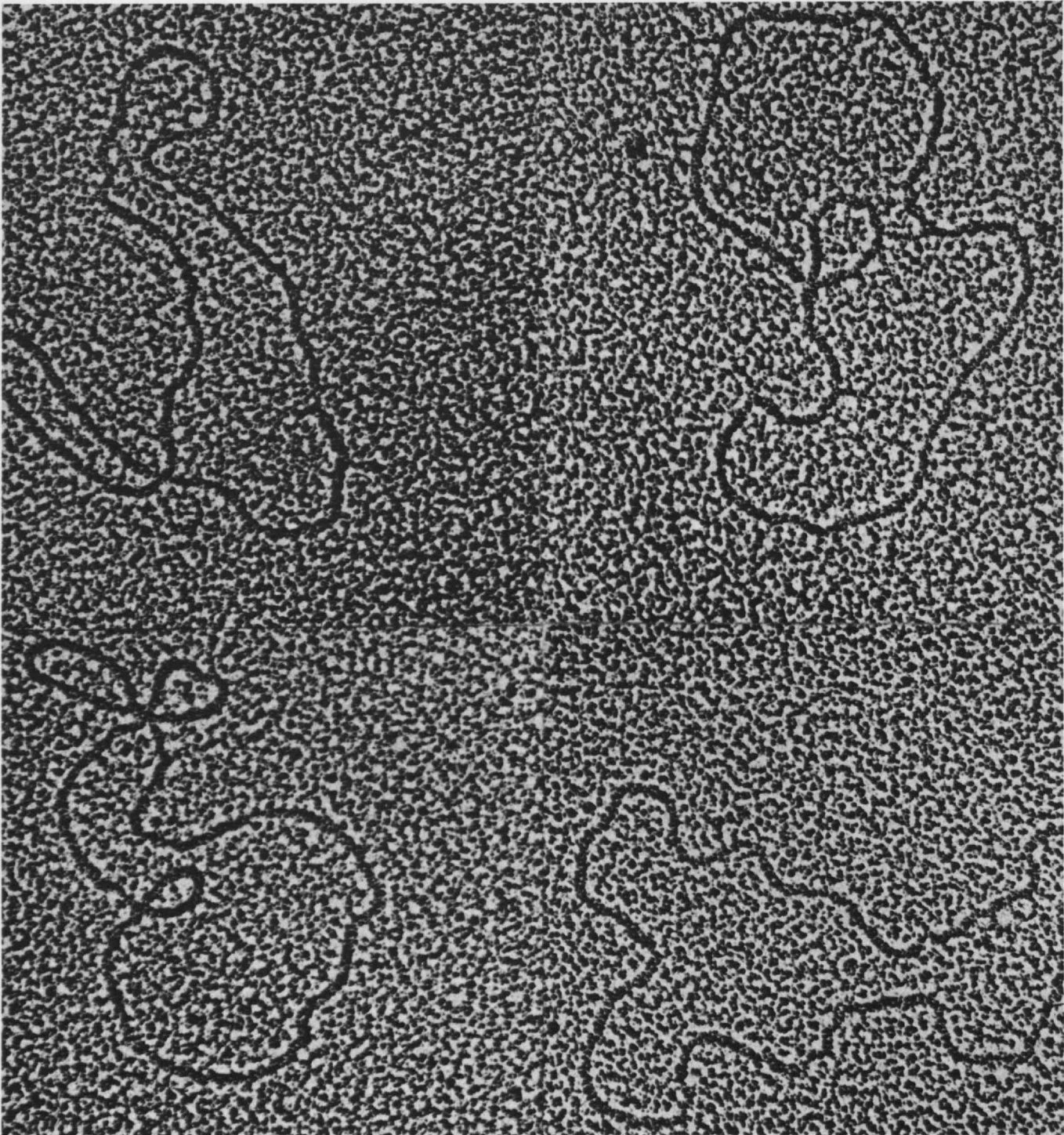
Further studies confirming the absolute necessity for circular DNA in the ØX DNA infectivity assay suggested that to provide an active synthetic copy it would be necessary to close the complementary strand built upon the viral DNA. Experiments revealed that the polymerase did not close

this ring, but, rather, once it had returned to its starting point, continued synthesis as with a native double-stranded DNA.

The stage was now set. In fact, although as yet unknown to the participants, there was but one more hurdle to overcome—and the means to surmount this was separately in preparation in four different laboratories of biochemistry. An enzyme was needed to close the gap when the new polynucleotide strand on the viral ring came back to its starting point. As it happened, such an enzyme to close gaps in polynucleotide strands—called polynucleotide ligase—had been discovered and was in process of isolation in the laboratories of M. Gellert (N.I.H.), J. Hurwitz (Albert Einstein Medical College), C. Richardson (Harvard Medical School), I. R. Lehman and B. Olivera (Stanford) and N. Cozzarelli and A. Kornberg (Stanford).

With the purification of this new enzyme to a degree where it was free of nuclease activity, it seemed plausible once again to attempt to synthesize an active viral DNA with ØX DNA templates. M. Goulian in Dr. Kornberg's laboratory undertook this problem with admirable intelligence and zeal. He discovered that by incorporating the polynucleotide ligase into the synthetic reaction mixture from the time of initiation he could, with good success (30 to 50 per cent), achieve the closure of the synthetic complementary strand as the polymerization reaction on the viral DNA ring approached the starting point. Further, once closed, such unbroken double-stranded DNA rings were no longer primers for synthesis with the polymerase but persisted intact. By appropriate

Electron micrograph of DNA rings produced in the synthesis described by the author, magnification approximately 170,000.



means they could be isolated. The partially synthetic double-stranded ring was shown to be infective; of course, as before, this could conceivably be entirely ascribed to the presence of the original viral DNA strands.

However, this time when the synthetic complementary strands were separated from the viral strands, the rings of the former as well as those of the latter were shown to be infective—and to very nearly the same degree. An active infective DNA had indeed been made.

To complete the cycle the synthetic complementary DNA rings were now used as the primers of a second round of DNA synthesis. The wholly synthetic double-stranded DNA rings of the product were isolated. From these the old synthetic complementary strands and the newly made synthetic viral strands were obtained. Both were infective. An active synthetic DNA identical to the original DNA was now at hand.

Intervening in the Synthetic Process

What is the significance of this accomplishment? I would suggest that most importantly it confirms that our understanding of these complex reactions is essentially correct. We originally failed and we failed again and we knew not why. Now we have succeeded and we know why earlier we failed.

Second, the ability to synthesize an active DNA in the test tube provides an opportunity to intervene in the synthetic process in a manner which we could never achieve as long as synthesis was confined to the dark recesses of a cell. Wide varieties of constituents can be introduced in a wide range of synthetic conditions and the biological consequences then examined. Such altered, synthetic viral DNA should be of great value for the further analysis of the processes of viral replication.

Third, this process is, as far as we know, open-

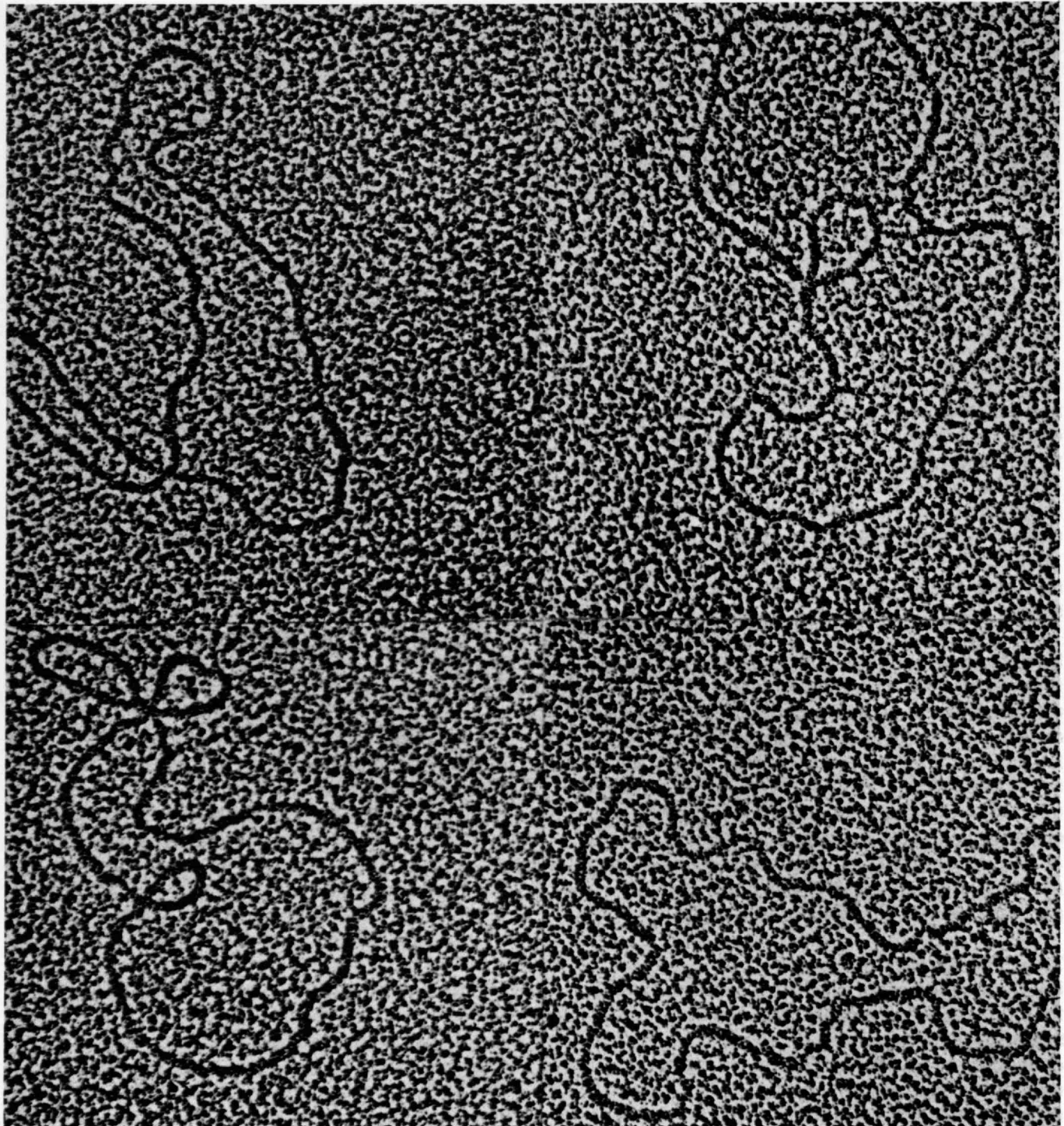
ended. It is not confined to the synthesis of this particular viral DNA. It can, at least in principle, be applied to the synthesis of other DNA's—to those of temperate viruses, of tumorigenic viruses, etc. And, as above, the introduction of variations should lead to greater understanding of the modes of action of such agents.

Ultimately, by progressive modification these procedures could lead to the synthesis of wholly new types of viruses—conceivably even “beneficial” viruses as contrasted to the many and well-known pathogens.

A wholly new approach is now available—by synthesis—for the study of the basic processes of life.

Last April Robert L. Sinsheimer became Chairman of the Division of Biology at the California Institute of Technology where he had been professor of biophysics since 1957. His work on the artificial synthesis of active DNA from a virus was based on two previous discoveries—the first single-stranded DNA and the first ring-shaped DNA. Dr. Sinsheimer received both his bachelor's and master's degrees from M.I.T. in 1942 in biology and a doctorate in 1948.

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The Nuclear Arms Race: Problems of Vertical Proliferation

The successful resolution of the 1962 Cuban missile crisis marked the beginnings of a decline in public discussion about one of the most awesome dilemmas of our time—the dangers of nuclear war. This was understandable. Nuclear weapons have come to be regarded as “unusable”; concern has focused instead on instances of violence using more traditional methods. There have been many—local wars in Vietnam, the Middle East, and the Indian sub-continent; major civil wars in Nigeria, Indonesia, and the Yemen; *coup d'états* in Africa, Europe, and Latin America. Yet despite this plethora of limited wars and conflicts, the problem of nuclear weapons is still very much with us, and it is now entering a new, uncertain phase.

During the 1950's a fertile topic for speculation among those interested in the problems of international security concerned the so-called “Fourth” Power problem. There was speculation about which country would be next to join the U.S., Soviet Union, and Britain as a member of the exclusive nuclear weapons club. Since then China and France have joined the club but have refused to co-operate in any multilateral effort to solve the current “Nth” Power problem. Concern today relates to the “Nth,” rather than the “Sixth” Power problem; it is felt that if one of the several potential candidates for the dubious honor of being Number Six decides to opt for nuclear weapons, more will very quickly follow suit—the nuclear “domino” theory. For instance, if India, a strong favorite for Number Six, builds the bomb, it will be very difficult—for a host of extremely complicated economic, political and strategic reasons—to persuade West Germany, Japan, Italy, Pakistan, and possibly Israel and South Africa to agree to unilateral restraint. If these countries build bombs it would only be a matter of time before many others probably join the league—Sweden, Switzerland, Egypt, Brazil, Australia.

What would a world of nuclear powers be like? There would be big nuclear powers such as the U.S. and the Soviet Union armed with all the esoteric paraphernalia of modern technology; medium

powers such as Britain, France, China, and West Germany, unable to challenge effectively the U.S. and Soviet Union but quite capable of threatening other countries; and mini-nuclear powers like Israel and Pakistan, armed with only a handful of fission (atomic) bombs that might, nevertheless, be decisive in certain strategic contests. Would this world be more or less dangerous than the world we live in at present? Is there a demonstrable correlation between an increasing number of nuclear powers and an ascending probability of nuclear war? Would nuclear war in a multi-nuclear world be a total world war or could there be a limited local nuclear war? Though none of these hypothetical questions can be answered, statesmen and private citizens in many countries have been sufficiently worried by the prospects of a multi-nuclear world to press for a treaty to halt the spread of these nuclear weapons.

Non-Proliferation and Disarmament

For three years the Eighteen Nations Disarmament Conference (E.N.D.C.) has met at Geneva to consider various drafts for a treaty on the Non-Proliferation of Nuclear Weapons (N.P.T.), presumably to be signed by all the major existing and aspiring nuclear powers (except China and France). In March, 1968, after much bickering among most of the members of the E.N.D.C., the Soviet Union and the U.S. presented identical draft treaties which were acceptable to the conference. To have had the two major powers agree to submit identical drafts on such an important issue was a remarkable tribute to the tact, patience, hard work, and good sense of the representatives. It now remains to be seen how many nations will sign the treaty even after its United Nations endorsement, and how effective the treaty will be in reducing the risks of nuclear war.

Even those who are skeptical of the long-term value of the N.P.T. as an instrument for preventing nuclear war nevertheless agree that the political importance of the treaty is very great. Since U.S.-Soviet political agreement is essential if there is to

be any progress towards a solution to the central problem of international security, the major arms race between the two great powers, any steps that lead to an improvement of U.S. and Soviet relations are welcome. However, it would be misleading to suggest that a successful conclusion of the N.P.T. will mark a dramatically new era in U.S.-Soviet relations, though if the Vietnam war were to be ended soon, there could be a return to the seemingly halcyon days that existed before President Kennedy's death and Premier Khrushchev's ouster. It is a mark of the Soviet Union's concern with nuclear proliferation and the importance its leaders place on a continuing East-West dialogue that the U.S.S.R. was prepared to co-operate with the U.S. at this juncture of time and suffer as a consequence the wrath of Chairman Mao for "selling out" to U.S. imperialism.

The implications of the proposed N.P.T. are to be seen in terms of U.S.-Soviet relations in more ways than one; it is felt that the long-term success of this treaty or any other is ultimately dependent upon eventual agreement between the existing nuclear powers (in effect the U.S. and Soviet Union) to control and curb their own nuclear arms race which continues to spiral upwards. This phenomenon, which is sometimes referred to as *vertical* nuclear proliferation, is not explicitly proscribed by the N.P.T., though the demands of the nonnuclear powers for some reciprocity was implicitly stated in Article VI which requires that "each of the Parties to this Treaty undertakes to pursue negotiations in good faith on effective measures regarding cessation of the nuclear arms race. . ."

Two factors seem likely to work against an agreement on U.S.-Soviet vertical nuclear arms control. The first concerns the technical progress made in recent years in two important interrelated areas of nuclear weapons technology—ballistic missile defense systems and offensive missile delivery systems. The second factor refers to the political atmosphere in the United States, which seems likely to become increasingly hostile to any attempt to check the projected growth rate of the U.S.

strategic arsenals. The bulk of the arguments presented here refer to developments in the United States rather than the Soviet Union because information on U.S. policy is easier to come by. Also the author accepts the thesis that since the United States is by far the stronger of the two superpowers (in terms of G.N.P., growth rate, military capability, world influence and many other criteria), developments in the U.S. strategic posture are more likely to stimulate important responses in the Soviet Union than vice versa. This is not to berate development in the Soviet Union but rather to suggest that the initial responsibility for curbing the *present* arms race lies with the U.S.

Technology and the Sharpening Arms Race

Technical developments in ballistic missile defense (B.M.D.) and offensive missiles—both of which hold gravest importance for international security today—can conveniently be discussed separately, despite the fact that the two concepts are mutually interdependent. Because there has been a great deal written about the political and strategic implications of B.M.D., more emphasis is given here to the new offensive missile systems. This in no way discounts the importance of Mr. McNamara's announcement in September, 1967, that the United States was to begin deployment of a limited B.M.D. system, later called Sentinel.

New Technology in Defense

The Sentinel system is designed to be effective against an irrational Chinese nuclear attack against the U. S. in the 1970's: it is also supposed to have a residuary capacity to protect some Minuteman silos and insure against the accidental launch of an offensive missile against the U.S. by the Soviet Union, or anyone else. It is difficult to imagine under what conditions China would be prepared to launch a suicidal attack against the world's strongest power, and the strategic community in the United States, Europe and Asia is sharply divided on the wisdom of this limited B.M.D. deployment. So far there are few supporters for a full-scale deployment of B.M.D. designed to operate

against the Soviet Union, though critics of the limited deployment argue that it is only a matter of time before a more elaborate and costly (between \$40-\$80 billion) B.M.D. system is proposed. The supporters of the Sentinel system argue that it will be relatively cheap (\$5 billion), will be effective against China in the 1970's, and will have important political payoffs in the Far East since the protection now afforded to the U.S. will increase the credibility of the U.S. guarantee to protect noncommunist Asian countries from Chinese nuclear blackmail. The critics of the Sentinel system argue that its technical feasibility, even against China, is questionable and that the decision to deploy it was politically damaging.

Probably the most authoritative case against a full-scale, in contrast to limited, B.M.D. deployment has been frequently put by ex-Defense Secretary McNamara: it is pointless to try for an entirely effective B.M.D. system against the Soviet Union since it would always be cheaper for the Soviet Union to nullify a U.S. B.M.D. system by building more offensive missiles. For this reason many were surprised when Mr. McNamara made his San Francisco speech announcing Sentinel. Three-quarters of this speech was a cogent and lucid argument against the B.M.D. concept. This has led to speculation that the primary reasons for the Sentinel system are political; President Johnson, anxious to avoid for the Democrats a replica of the "missile gap" argument used very effectively by Kennedy in the 1960 election campaign, persuaded Mr. McNamara to "sell" B.M.D. as a China-orientated system. Few believed Mr. McNamara's explanation told the whole story; a B.M.D. system is so highly automated that it does not have time to distinguish between an incoming Chinese or Soviet missile. The Soviet Union, therefore, could not possibly ignore the effect of a "China-orientated" system in its calculations about the effectiveness of its own capability to strike the U.S. with nuclear missiles.

But perhaps the most damaging arguments against the Sentinel system are political. While some critics accept that developments in B.M.D. technology have made great strides and that in certain circumstances limited B.M.D. deployment may be an alternate method of providing some defense for important military installations, they oppose the present deployment plans because of their adverse effect on the international strategic climate. It is argued that limited B.M.D. deployment, rather than strengthening the credibility of the U.S. guarantee to nonnuclear powers, will weaken it. Put crudely, the argument asks, "How can West Germany, Japan, or India take seriously the U.S. contention that it will threaten to use nuclear weapons on their behalf if it is afraid of the unlikely threat posed by China?" The cornerstone of the U.S. strategic

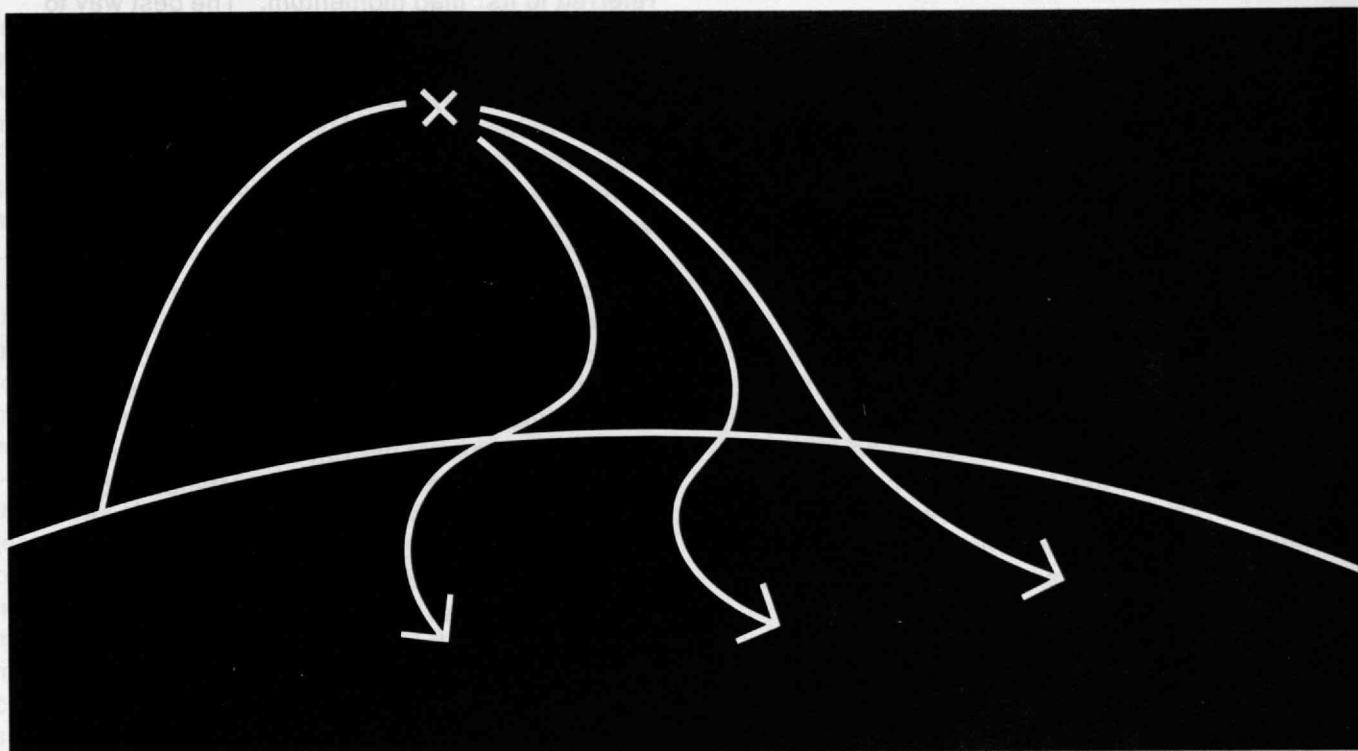
guarantees to its allies depends on a conscious denial of the "Fortress America" concept. This concept, with its overtones of isolationism, is likely to be reinforced by unilateral defensive measures taken by the U.S. government, especially if these measures are invoked as part of a crash program which is thought to be the beginnings of a much wider defense deployment.

A more subtle but more worrying effect of B.M.D. on the strategic climate concerns the stability of the balance of nuclear power between the U.S. and the Soviet Union. It has been suggested that the installation of certain types of B.M.D. systems in both the U. S. and Soviet Union could, once again, raise fears that one side will think the other has a considerable advantage if it were to strike first in a nuclear war, especially if account is taken of the new highly accurate offensive missiles that have been developed.

Offensive Missile Breakthroughs

At approximately the same time that the development in B.M.D. technology occurred, there was a similar breakthrough in offensive missile design—the development of missiles designed to carry multiple warheads. This means that one missile launcher can now fire several warheads in one shot at a target, thus posing extreme problems for the defense. Now there is still a more important related development: the multiple warheads can now be pre-programmed with great accuracy onto *separate* targets, perhaps hundreds of miles apart. Thus one new missile launcher will be able to duplicate the task of several present-generation launchers. This new multiple, independently targetable re-entry vehicle, or M.I.R.V., is to be fitted to the next generation of intercontinental ballistic missiles (I.C.B.M.'s) to be deployed by the U.S. and maybe retrofitted to some existing launchers. Depending on the individual warhead's size, at least 10 such warheads will apparently fit into one Poseidon or Minuteman III missile, though the exact number will vary according to the mission of the launcher. At present the U.S. has about 1700 missile launchers (1054 in hardened silos located in the U.S., 656 in Polaris submarines); in 1967 the Soviet Union had approximately 750 (720 land-based, 30 sea-based). If over the next few years the U.S. equips some of its present launchers with M.I.R.V.'s, and introduces into service new launchers with M.I.R.V.'s, the number of launchers will probably remain the same (1700) but the number of separately targetable warheads *could* rise from 1700 to anything between 5000-16,000. It is highly unlikely that the number of Soviet *launchers* could rise to more than 2000 in this period; thus in the worse possible case the Soviet Union would have to assume that the U.S. could fire at least 10,000 *separate warheads* against 2000 Soviet *launchers*, a ratio of about 5

The nuclear arms race has been brought to a new, uncertain phase with the development of missiles designed to carry multiple warheads which can be programmed onto separate targets and which can approach those targets by low-level flights which are at once hard to detect and to intercept.



to 1 compared to today's figure of approximately 2 to 1. This sort of calculation could be reversed if the Soviet Union fits its launchers with M.I.R.V.'s too, but most experts believe the U.S. is far ahead of the Soviet Union in this field.

A great improvement in missile accuracy has also helped to increase the effectiveness of warheads. This has special relevance for the counter-force role—as opposed to counter-city role—of offensive warheads. In the past, the circular error probability (C.E.P.) of offensive missiles was sufficiently high so that several large warheads were needed to assure destruction of one hardened missile silo; now it is believed that the exchange rate, warheads vs. launchers is more favorable to the offense. Not only does the side that fires first have an overwhelming advantage in terms of separately targeted warheads; now, if proportionately fewer warheads are needed to destroy one launcher (containing perhaps 10 M.I.R.V.'s) the exchange rate in

terms of warheads vs. warheads could change from a ratio of A to B where $A > B$ to one of A' to B' where $B' > A'$.

The Delicate Balance of Terror

However, it is extremely misleading to infer from these highly simplified calculations that the balance of power would shift so markedly in favor of the side that fired first that a first-strike strategy would become a realistic option. To postulate the various alternative force structures and the expected damage that each side could make on the other requires some elaborate, though not unfeasible, calculations based on estimates of the numbers, types, and locations of aiming points in the target system, the numbers of weapons of a particular size which must be delivered at enemy targets to guarantee a high probability of their destruction, and the reliability and serviceability of the respective missile forces before, during, and after a nuclear exchange. Nonetheless the M.I.R.V. will almost

certainly downgrade the second-strike capability of land-based missiles with fixed co-ordinates, e.g., present generation U.S. Minutemen and Titans, and the Soviet equivalents, which account for the largest proportion of both sides' strike forces. There will, of course, always be an element of uncertainty as to the effectiveness of any strategic system, especially those using nuclear weapons; nuclear war has never been tested.

For the past 10 years this uncertainty has meant, among other things, that the Soviet Union and the U.S. have believed each other capable of effectively destroying the other's society *even if one side launched a pre-emptive first strike*. This mutual "assured destruction" capability remains the cornerstone of nuclear deterrence; any developments that reduce this capability must undermine the structure on which the delicate balance of terror has come to be based.

Since 1960 senior U.S. spokesmen have frequently stressed, often in conflict with members of Congress and leaders of the armed forces, that it is not in the interests of either the U.S. or Soviet Union to achieve a position of massive nuclear "superiority" for fear that the weaker side may feel special vulnerability to a first strike by the stronger side. Mr. McNamara's attempt to educate the public and Congress on this point was one of his more notable crusades; it remains to be seen how successful he has been. The position of "superiority" also holds the threat of a preventive pre-emptive first strike by the weaker side which feels nuclear war "inevitable" or highly possible and so chooses to lower the risks and costs to its own forces and society by hitting first, especially at enemy forces. It was precisely this sort of fear that abounded in the 1950's when the term "surprise attack" was common parlance among the strategists.

Though the U.S. and Soviet Union have both probably come to realize that it is in their interests for both to feel confident of having strong second-strike forces, which cannot be destroyed by a sur-

prise attack, the fact is that such a balance was an acceptable doctrine only when existing technology made reasonable the assumption that a certain proportion of missiles and command and control facilities would be invulnerable to first strike. Now, 10 years later, technology is apparently upsetting the relatively stable doctrines of the 1960's; there is no use advocating a second-strike doctrine if one's adversary is developing systems that render it impotent.

Adding "Mad Momentum" to the Arms Race

It is at this point that the spiral of the arms race becomes increasingly obvious: Mr. McNamara has referred to its "mad momentum." The best way to lessen the credibility of the new offensive missiles is obviously to make it more difficult for them to effectively destroy their targets. There are several ways of doing this; each alternate method has a cost, both economic and political. The number of launchers containing second-strike warheads can be increased; silos of existing launchers can be "super-hardened" to raise the cost of destruction. Launchers can be placed on mobile platforms which offer greater probability of remaining undetected by the enemy; the most popular mobile platforms are submarines, but it is also possible to install launchers on railroads or in aircraft (the new giant C-5A transport aircraft could carry several). Or hardened static silos can be "defended" by a point defense anti-ballistic missile system—an option which could become increasingly attractive to the U.S. if it could be shown that the deployment of a B.M.D. system would increase the protection of its second-strike land-based forces and if, into the bargain, the system was effective against a nuclear threat from China.

However, the economic cost of all these alternatives—which according to U.S. official policy have but the one major objective of preserving the credibility of the U.S. second strike forces—is enormous. The unit cost of buying a "satisfactory" nuclear arsenal is rising to unprecedented heights.

The Politics of Military Competition

The escalating impact of technology on the nuclear arms race would not be cause for such concern if the political leadership in the Soviet Union and U.S. could work out some mutual agreement to contain this proliferation. But the present political mood of the U.S. is not cause for optimism. Some have even suggested that there will be a deliberate escalation of nuclear weapons deployment for political, as well as strategic, reasons. The limited B.M.D. decision has already been mentioned. Another source for worry concerns the political atmosphere that may exist in the U.S. if and when the Vietnam war is ended. If a peace settlement on Vietnam is reached on terms generally considered

Satellites alone can produce the quantity and quality of data necessary on a global basis to extend accurate weather forecasting and basic meteorological knowledge.

Over a quarter of a century ago, the first satellite photograph of Earth's surface was taken by N.A.S.A.'s ATS-1 satellite, from a stationary orbit 22,300 miles above the equator near the Atlantic Coast of South America. The photograph shows such typical weather systems as a small extratropical cyclone just off the northeastern coast of the United States, a cold front extending from the North Atlantic, two other cold fronts extending from the North Atlantic into eastern Brazil and Argentina, and clouds associated with the inter-tropical convergence zone that extends halfway across the Atlantic from Africa. Weather satellites today offer meteorologists their only opportunity to gather on a worldwide basis the vast amount of data demanded by modern numerical methods of forecasting. (Photo: N.A.S.A. News Team Engineering News)

Meteorology by Satellite

unfavorable to U.S. prestige and interests, the inevitable process of reappraisal will include voices who refer to those who "sold out" to the communists. In the presence of this backlash, no President, Republican or Democrat, could afford to support strategic policies that appeared to include an adjustment of the balance of power between the U.S. and Soviet Union in the latter's favor.

If the Soviet Union is as advanced in nuclear weapons technology as the U.S. and has the resources to deploy M.I.R.V.'s, B.M.D. and their complementary systems, then it can be argued that there will be no change in the effective strategic balance—only a rise in the costs of deterrence. However, if the Soviet Union lags behind the U.S. in these technologies by a number of years then there could be a period of increasing instability until such a time as the Soviet Union catches up. And there is indeed a general feeling that the U.S. is far ahead in the really sophisticated technologies. If this crucial time period, during which U.S. nuclear superiority strides ahead, coincides with a further erosion of U.S.-Soviet relations over some new problems in Southeast Asia, the Arab-Israeli dispute or even developments in Europe, only a little imagination leads one to suggest that the era of nuclear brinkmanship has not been removed from the ground rules of international diplomacy.

One way to remove some of the pressures for continued U.S. emphasis on nuclear superiority is, as Mr. McNamara has frequently said, to promote an intelligent public debate on issues of national security. Inevitably military planners have to make conservative estimates of enemy intentions, but this should be no excuse for allowing every conceivable weapons system to be procured. It is particularly unfortunate that this need for an articulate and informed debate on strategy coincides with an election year and a period of bad relations between U.S. universities and the government. Members of the academic community, especially those whose work embraces the frontiers of these new technologies, have a special responsibility to

ensure that the public, the legislation, and the various pressure groups appreciate the basic facts of defense policy and the nuclear arms race. Only then will it be possible to exert political control on the demand for "superiority" against the Soviet Union. Nuclear superiority will never assure the United States a 100-per-cent-effective defense system; but it may well upset the balance of power and increase the probability of nuclear war. Indeed it is to be hoped that those who understandably demand that universities sever their connections with "war-related" research do not lose sight of the long-term implications that such a divorce could have for this nation and the whole world.

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Over a quarter of the earth's surface appears in this photograph taken by N.A.S.A.'s ATS 3 satellite, from a stationary orbit 22,300 miles above the equator near the Atlantic Coast of South America. The photograph shows such typical weather systems as a small extratropical cyclone just off the north-eastern coast of the United States, a cold front over the Central North Atlantic, two other cold fronts extending from the South Atlantic into eastern Brazil and Argentina, and clouds associated with the inter-tropical convergence zone that extends partway across the Atlantic from Africa. Weather satellites today offer meteorologists their only opportunity to gather, on a worldwide basis, the vast amounts of data demanded by modern numerical methods of forecasting. (Photo: N.A.S.A. from *Tech Engineering News*)

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William K. Widger, Jr., Sc.D.'49

Meteorology by Satellite

The surface of the earth covers about 197 million square miles; yet atmospheric conditions, at altitudes of more than a few tens of feet above the surface, are observed by only about 450 radiosonde stations.

The average distance between such stations is some 700 miles. Yet analyses indicate that forecasts by modern numerical weather prediction techniques suffer significantly when observations are more than 600 miles apart. The lack of weather observations is particularly evident at the levels from 10,000 to 40,000 feet above sea level, where the flow patterns generate most of our weather.

In reality, the situation is even worse. Some 100 (22 per cent) of the 450 stations are located in the United States and Canada, which include less than 5 per cent of the earth's surface. Only there, over the North Atlantic, and over most of Eurasia (perhaps 20 per cent of the total area of the earth) does the station density equal or exceed that deemed minimal for good weather forecasts. Over most of the North Pacific, the tropics, and the entire southern hemisphere, weather observations are grossly inadequate. Indeed, only since 1966, when fully global observations on a daily basis were initiated by the E.S.S.A. series of weather satellites, has the Environmental Science Services Administration made routine operational analyses of most of the regions south of about 20°N latitude.

Although plans for the international World Weather Watch include a number of additional radiosonde stations at key locations in the tropics and the southern hemisphere, it is just not feasible to provide such stations over the entire world. Costs are prohibitive, particularly in ocean areas devoid of islands where special ship stations would be required, and there are serious problems of logistics and manning of remote stations which also preclude such a network.

Today, meteorologists generally agree that only weather satellites can collect sufficient worldwide

data to extend the time range of reasonably accurate forecasts from the present limit of about two days to perhaps as much as 10 days. (Several recent studies suggest that forecasts over ranges longer than about 10 days present a very different kind of problem, since weather 10 days hence is determined by disturbances now too small to detect.)

Fundamental Problems for Weather Satellites

The first of N.A.S.A.'s TIROS satellites proved the basic feasibility of this form of global weather observation. Based on their fundamental technology and several significant improvements tested on N.A.S.A.'s TIROS VIII and Nimbus I, TIROS IX and X provided interim global coverage, while TIROS IX also served as the developmental prototype of the fully operational E.S.S.A. series, and of the improved data acquisition and processing system that permits optimum use of their observations.

Even these data, however, fail to meet the full needs of the weather forecaster. For one thing, although at least two E.S.S.A.'s are now always in operation, they can provide a daily maximum of only two observations of most areas. Hence, the smaller, shorter-lived (but sometimes severe) weather systems, such as convective showers, thunderstorms, and many squall lines, frequently develop and propagate unobserved.

That this deficiency can be overcome has been demonstrated by two of N.A.S.A.'s Applications Technology Satellites (ATS). Placed in synchronous equatorial orbits at 22,300 miles, they appear to hover over selected points on the equator and provide pictures which cover nearly one-quarter of the earth. Since each satellite can make such a picture once every 20 minutes, the satellites can indeed detect and follow smaller scale developments during daytime hours. Extension to nighttime observations demands more sensitive detectors; even then the intervening, high-level night airglow may prevent observations over the darker phases of the lunar cycle. The ATS satellites can also be used as communications relay points for distribut-

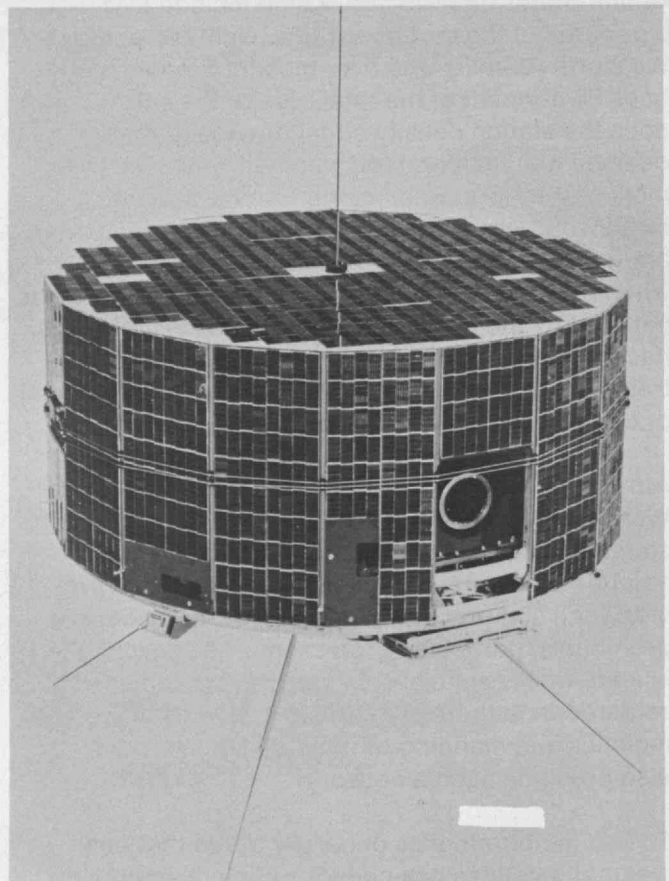
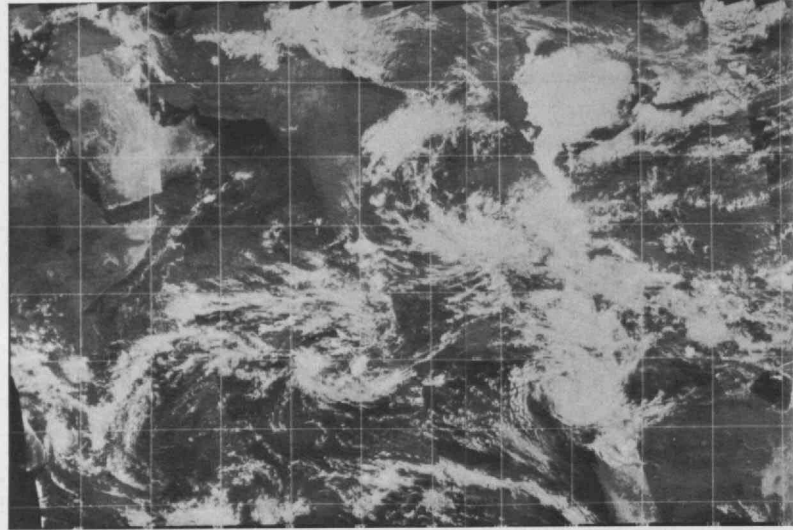
E.S.S.A. weather satellite (left, below) and a typical global mosaic prepared by computer from E.S.S.A. television data gathered during a single day. The spin axis of the satellite is perpendicular to the plane of its orbit, giving it the appearance of rolling along its orbit. It takes pictures at intervals frequent enough to provide reasonable frame-to-frame overlap. Such satellites now provide global coverage every day on an operational basis (except for areas of 24-hour darkness near one pole). The benighted North Pole is responsible for the blank section in the northern hemisphere; the mosaic was taken in January, 1967. (Photos: Environmental Science Service Administration)

ing selected weather charts and cloud pictures to properly equipped local weather stations.

A more fundamental problem is that satellite cloud pictures permit only semi-quantitative inferences as to the atmospheric flow patterns and parameters such as pressure, temperature, and humidity. These are the basic data required by the numerical weather prediction models which form the foundation of modern weather forecasting. While such significant weather systems as major cyclonic storms, fronts, jet streams, troughs and tropical storms can readily be identified in the TIROS, Nimbus, ATS, and E.S.S.A. pictures, and the associated flow patterns and conditions inferred, the consequent analyses still lack the precision necessary to match the capabilities of the numerical models (even though they do represent a significant improvement over what would otherwise be possible).

New Techniques under Development

Two promising ways of overcoming this deficiency would have received their first satellite test on the third Nimbus—Nimbus B—whose Thorad-Agena launch vehicle malfunctioned and had to be destroyed two minutes after lift-off on May 18. (It now appears the next Nimbus launch must be delayed until late 1969.) The first of these techniques will use observations of the infrared radiation emitted from the earth and its atmosphere to permit calculation of the vertical profiles of atmospheric temperatures, and in time also of humidities. This approach was first suggested by L. D. Kaplan and the specific techniques have been developed by David Q. Wark and D. T. Hilleary of E.S.S.A.'s NESC, Rudolph Hanel of N.A.S.A.'s GSFC, and their colleagues. The technique depends on the fact that the transmissivity of the atmosphere varies from a low value near wavelengths of 6 microns (μ) (owing to absorption by water vapor), to near unity at about 10 to 11 μ , and to low again near 15 μ (here owing to absorption by carbon dioxide). In spectral regions of low transmissivity, most of the infrared radiant energy reaching a satellite sensor comes



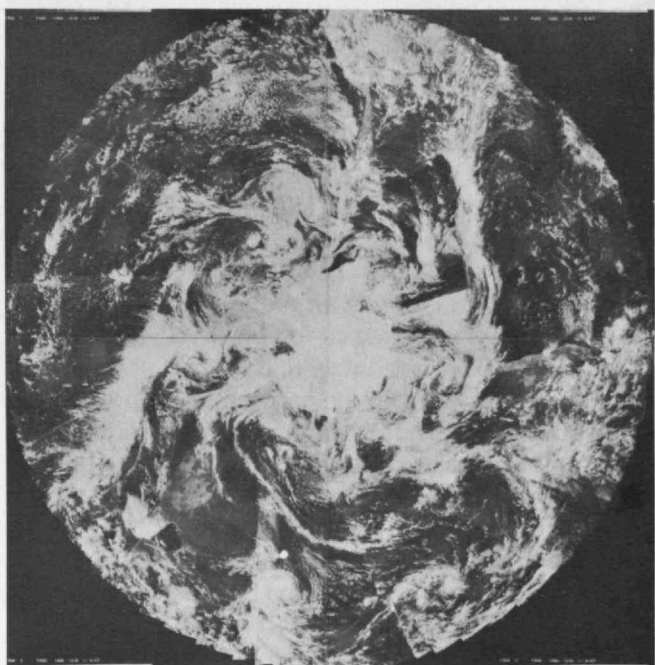
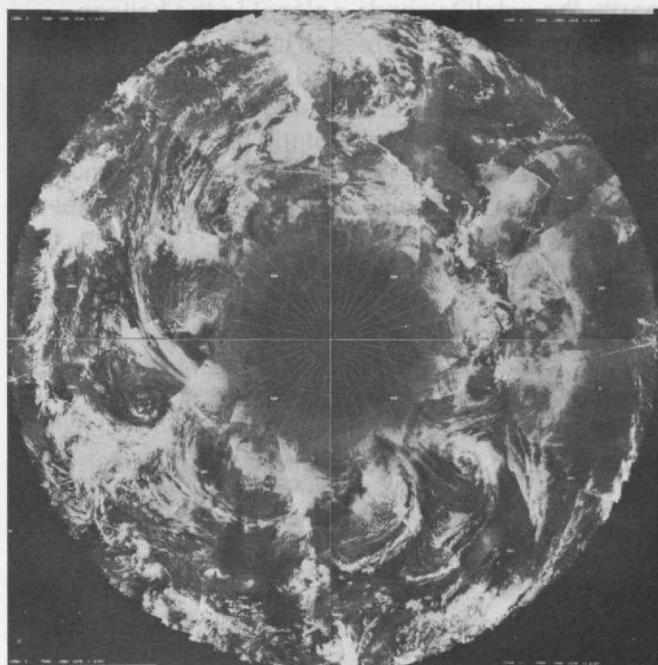
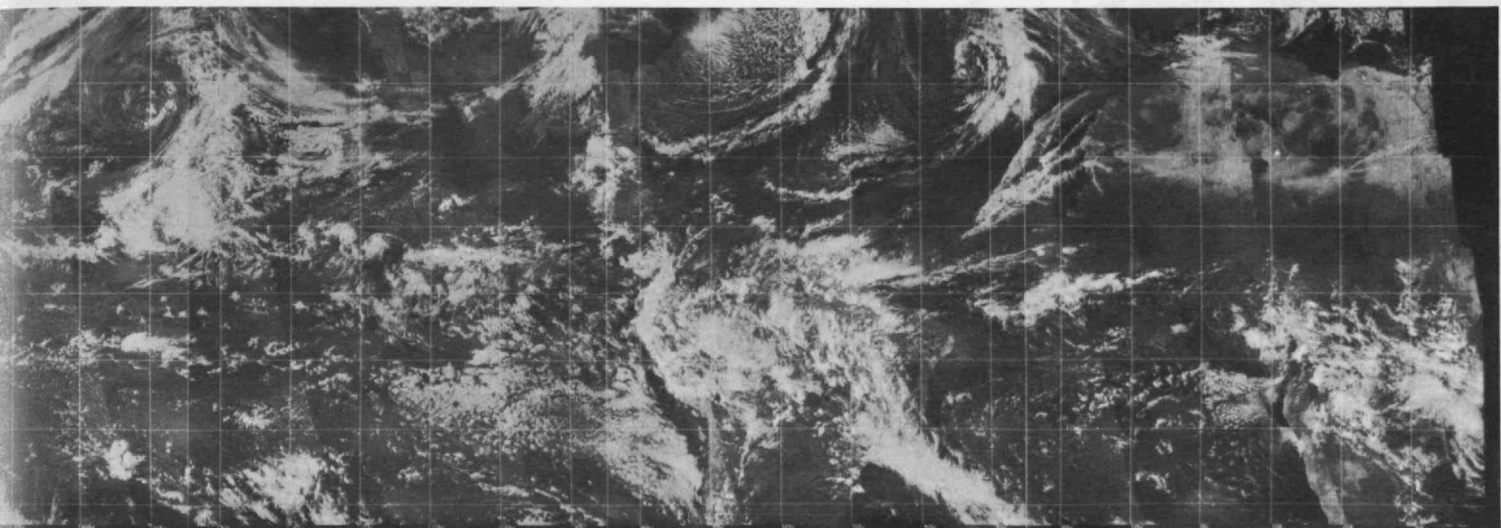
and critical to optimum use of the physical weather prediction techniques.

Satellite Information of Automatic Observing Stations

The second new technique that was scheduled to receive its first test on Nimbus B makes use of the satellite to locate and interpret observing platforms on the earth's surface, including ocean buoys and balloons floating with the wind at essentially constant altitudes. If the geographical positions of floating balloon or drifting buoy can be detected at appropriate intervals—say the order on an orbit period of about two hours for a balloon, and somewhat longer for a buoy—the difference in positions

from the known location of the atmospheric station will provide a means of determining the wind velocity and direction. On the other hand, the regions of high transmissivity, most of the clouds observed by a satellite, follow from the rainfall, clouds, and other weather conditions at the highest cloud and local (transmission) levels. The limited definition of the atmospheric above in intermediate regions (say 1 to 5, and 15 to 100, the major portion of the radiation comes from intermediate levels whose heights increase as the transmissivity decreases.

Scientists have already used these principles to acquire additional data, principally for use in



Concurrent with these scientific developments, Vincent E. Lilly, Jr. of the National Center for Atmospheric Research, has demonstrated that a series of ground-based balloons flying at constant altitudes will survive several months of drifting through the atmosphere without significant change

in their position. This is the first step toward a network of balloons, which would provide a means of observing the atmosphere in a way that is complementary to the horizontal and vertical observations provided by a series of weather balloons. This is a very novel type of information.

from the higher layers of the atmosphere, since the radiation emitted by lower layers is largely absorbed by layers above. On the other hand, in regions of high transmissivity, most of the radiation observed by a satellite comes from the highest opaque surface (the earth's surface in clear areas, or the highest cloud surface in overcast regions), with only limited attenuation by the atmosphere above. In intermediate regions (say 7 to 8μ , and 12 to 14μ), the major portion of the radiation comes from intermediate levels whose heights increase as the transmissivity decreases.

Scientists have already used these principles to acquire additional data, principally for use in research, from several earlier TIROS and both previous Nimbus satellites. Observations over the spectral ranges 8 to 12μ , 10 to 11μ , and another region of high transmissivity near 3.7μ , have led to the determination of land and sea surface temperatures, to observations of clouds at night—cloudy areas can be identified since their tops are usually colder than the adjacent or underlying land or sea surfaces—and to deduction of cloud top heights, based on their observed temperatures and concurrent or climatological vertical temperature profiles measured by radiosondes. Observations at 6μ have provided general information on the relative amounts of water vapor in the upper troposphere, while those at 15μ have provided the first global maps of lower stratospheric temperatures.

The improved instrumentation on the next Nimbus will make observations at several very narrow spectral intervals between 15 and 14μ , one near 11μ , and several between 8 and 6μ . The 11μ observation will provide a base point—the temperature of the highest opaque surface, whether earth or cloud. The series between 14 and 15μ , where the absorber is carbon dioxide whose vertical distribution is known and essentially constant, will be used to obtain the vertical temperature distribution, from the highest opaque surface to about 100,000 feet, with a resolution of about 10,000 feet. (It should be noted, however, that the mathematical processing necessary to recover the vertical distribution is extremely sensitive to observational errors and is further complicated by other inherent problems.)

Once the temperature profile has been determined, a second series of observations between 6 and 8μ , where the satellite-measured radiation depends on the vertical profiles of both temperature and water vapor, will yield the water vapor profile. Furthermore, since the vertical profiles of pressure, density, and temperature are strongly interrelated, and the winds are strongly related to the horizontal pressure and temperature gradients, a series of vertical temperature profiles over several different points will produce other types of informa-

tion crucial to optimum use of the numerical weather prediction techniques.

Satellite Interrogation of Automatic Observing Stations

The second new technique that was scheduled to receive its first test on Nimbus B makes use of the satellite to locate and interrogate observing platforms on the earth's surface, including ocean buoys, and balloons floating with the wind at essentially constant altitudes. If the geographical positions of floating balloon or drifting buoy can be detected at appropriate intervals—say the order on an orbit period or about two hours for a balloon, and somewhat longer for a buoy—the difference in positions combined with the time between successive observations gives the wind speed at the balloon level, or the speed of the ocean current.

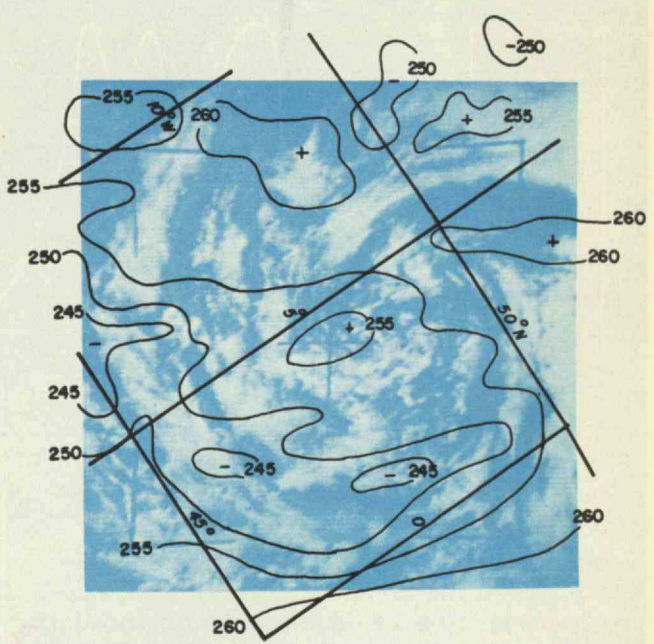
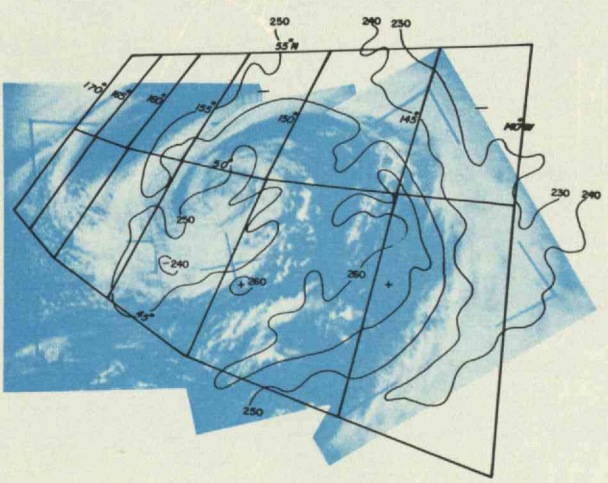
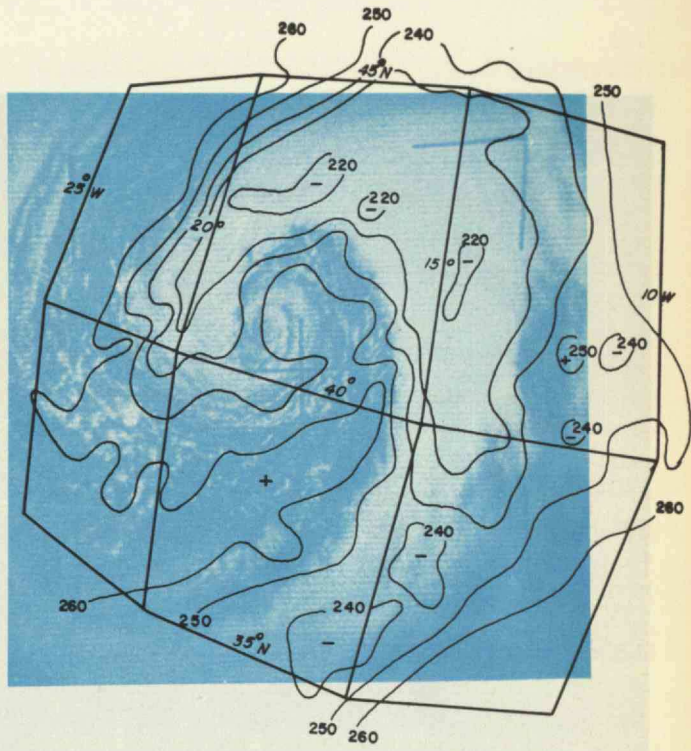
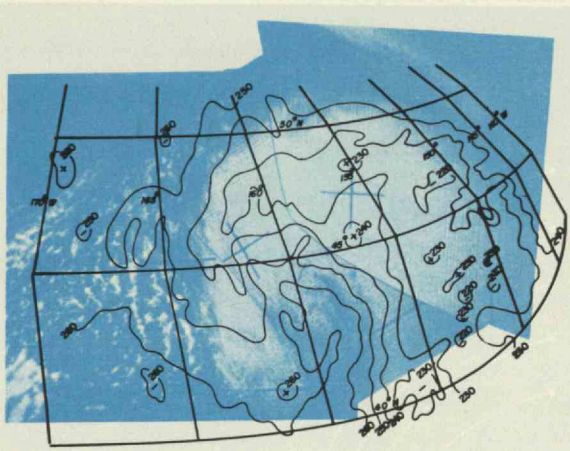
Two ways of determining these speeds are possible. In one, which could be used from any satellite altitude, the balloon, or buoy, intercepts phased radio signals from three land-based so-called Omega stations. On interrogation, the balloon relays these signals to the satellite, which stores them until it, in turn, is interrogated by a Data Acquisition Facility. Technicians receiving the data on the ground can then compute the balloon's positions.

In the second method, usable only from satellites not more than a very few thousand miles above the earth, the satellite sends a signal to the balloon, including a coded address to insure that only a selected balloon will respond. Precise measurement of the time of transmission from satellite to balloon leads to the range of the balloon from the satellite. Two or more such ranges, taken from known points a few minutes apart along the satellite's orbit, yield the balloon's position from the intersection of the range circles. This so-called Interrogation, Recording and Location System (IRLS), has been developed by N.A.S.A.'s Goddard Space Flight Center. The French have developed a somewhat similar system.

With any of these systems, following or concurrent with the location procedures, the satellite interrogates the balloon, buoy or other observing platform as to temperatures, pressures, or whatever observations it has been equipped to make. These, too, are stored in the satellite for subsequent relay to the ground.

Concurrent with these satellite developments, Vincent E. Lally, '48, of the National Center for Atmospheric Research, has demonstrated that a series of ground-tracked balloons flying at constant altitudes will survive several months of drifting through the atmosphere without significant change

Four stages in the life cycles of extratropical cyclones, as seen in pictures and infrared analyses from TIROS satellites. From left to right the pictures show an early stage of development, the most intense stage, full maturity, and dissipation. Clouds stay largely to the east of the storm center in the early stages, thus reducing cooling in the warm air and maintaining contrasts of temperature and potential energy in the system. In the later stages, the cloud patterns and infrared cooling become more symmetrical, reducing the effects that may help to provide the storm with its source of energy. (Photo: Allied Research Associates, Inc.)

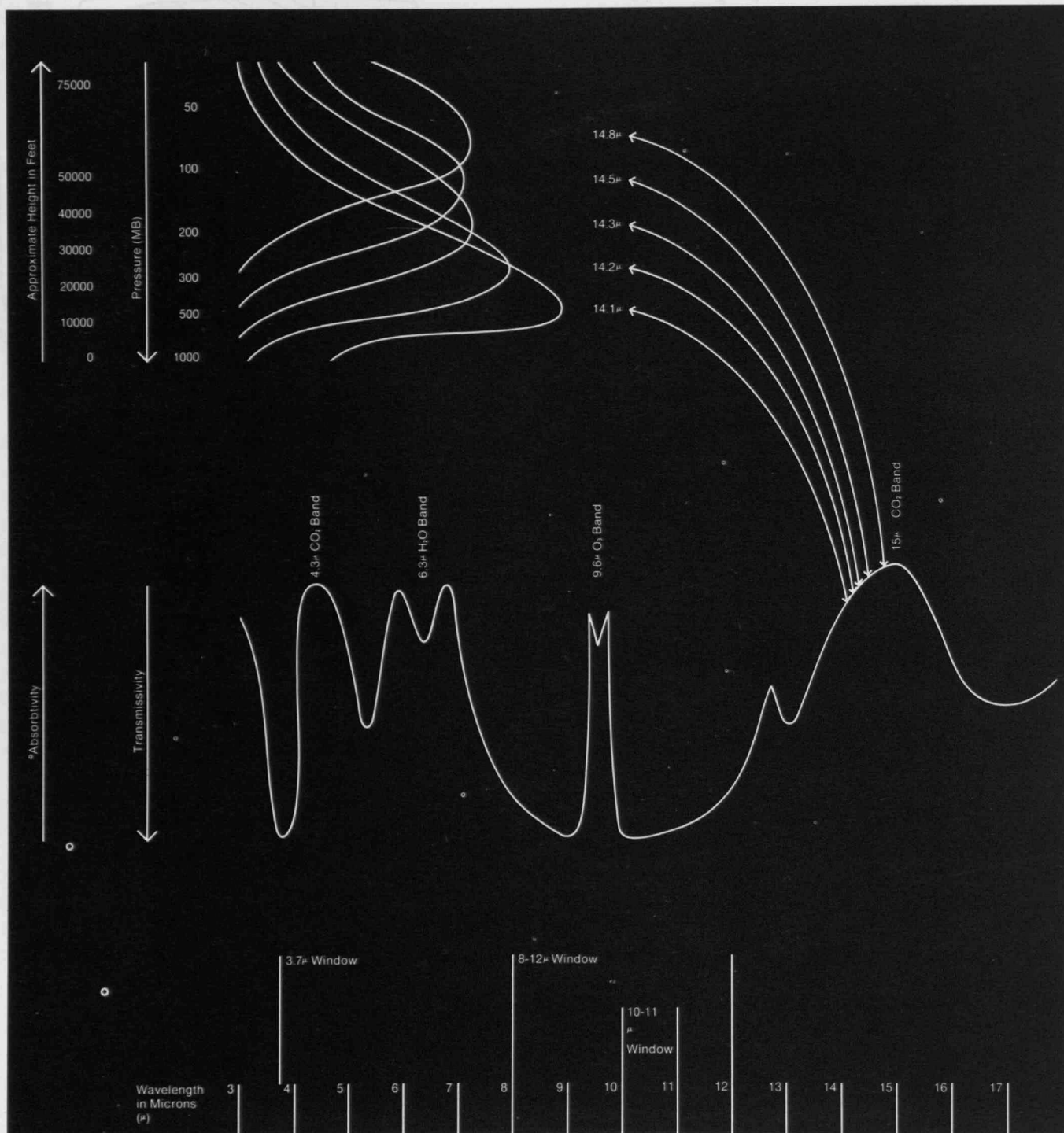


Variations in the transmissivity of the atmosphere at different infrared wavelengths allow meteorologists to interpret satellite data. The atmosphere's opacity to different wavelengths varies as a result of absorption by various atmospheric constituents. Thus, the wavelength of radiation observed by satellites allows inferences as to the height of the atmospheric layer producing it. Since the intensity of the radiation reflects the temperature of the emitting layer, such measurements make it possible to produce vertical temperature profiles of the atmosphere. The inset shows the relative contributions from different heights to the radiation observed by a satellite detecting in several separate, narrow wavelength bands.

...the use of the numerical ... techniques

Integration of Automatic Observing

The Nimbus-B technique that was scheduled to ... Nimbus-B makes use of the ... and interrogate observing plat- ... including ocean buoys, ... with the wind at essentially ... the geographical positions of ... drifting buoy can be detected at ... the order on an orbit ... for a balloon, and some- ... for a buoy—the difference in positions



in altitude or failure of their electronics, at least at levels above 30,000 feet. The major problems facing the balloon portion of the project, known as GHOST, now appear to be development of electronics and power supplies small and dispersed enough to insure no damage in the event of a collision with an aircraft, the political problems of overflight of certain other countries, and the desirability of being able to conduct sustained flights at levels nearer 20,000 feet, where the data would be of most direct value to current numerical weather prediction techniques.

These methods are far from the only advanced techniques now under development for satellite observations of the atmosphere. Others include obtaining atmospheric density, temperature, and pressure profiles by observing the refraction of stars as they sink below or rise above the earth's horizon, the use of microwave spectrometers to obtain temperature profiles, applying principles analogous to those discussed for the infrared spectrometers, and the use of manned satellites for meteorological observations, where the presence of the man as an operator and repairer might permit more sophisticated sensors as well as the detection of significant phenomena that have so far eluded our orbiting robot eyes. Nevertheless, the approaches I have discussed in greatest detail currently provide the greatest promise for increasing both our scientific understanding of the atmosphere and our ability to apply this knowledge to improved weather forecasts over the next few years.

Some Earlier Results

One of the first new discoveries from the TIROS I pictures was the unexpected extent of organized cellular convective clouds to the west of oceanic cyclonic storms and especially in the eastern portions of oceanic anticyclones. At first the relative dimensions of these cloud cells appeared to be anomalous, compared to those found in laboratory experiments. These were explained in due course, however, on the basis of typical atmospheric wind shears and temperature gradients that laboratory simulations fail to duplicate. Recently Lester F. Hubert of the N.E.S.C. has suggested that the differences between the two most common types of these cells (cloud-filled, as a result of upward air motions at the cell centers, and cloud-bordered cells with clear centers of descending air) may provide sensitive indicators of the vertical gradient of eddy viscosity, an important parameter in the problems of air-sea interaction.

At times some of the more stable areas associated with these cells show anomalous cloud lines which have been identified as "ship contrails." Their lengths—up to several hundred miles—are testi-

mony both to their persistence and to the degree to which relatively small-scale human activity and consequent air pollution may alter the natural environment, including increases in the local albedo (or reflectivity).

Radiometric observations in the visible spectrum by both TIROS and Nimbus on a far larger scale have shown, however, that the average albedo of the earth and atmosphere is about 5 per cent below pre-satellite calculations. This seems to be explained, at least in part, by a concurrent finding from the satellite pictures that ground observers typically overestimate the total cloud cover. In any event, the net amount of heat lost to space by infrared radiation from earth, and so the apparent planetary radiating temperature, must be higher than previously assumed. Nevertheless, the studies to date suggest that, even over periods as short as two weeks, the worldwide balance between absorbed solar and emitted infrared radiation is within the current probable error of the measurements.

Satellite observations of the sequence of development of extra-tropical cyclones have confirmed earlier studies in somewhat degrading the role of fronts in such processes while bringing the associated mid-tropospheric flow patterns into greater prominence. The initial disturbance is frequently a relatively minor trough between 10,000 and 30,000 feet, which reveals itself to the satellite through a characteristic comma-shaped cloud pattern produced by rising air ahead (just east) of it. During the relatively early stages of the storm, the cloud cover remains mainly to the east of the system center, coincident with areas of rising air. Only as the system matures, and thereafter, do clouds move to the western portions of the system.

The early-stage asymmetrical cloud patterns are favorable, from a radiation viewpoint, to the maintenance of contrasts of temperature and potential energy on which these storms depend. It has been suggested, although not yet demon-

Characteristic signature of a minor trough is a comma-shaped cloud pattern, produced by rising air just east of the trough. Such troughs, occurring between 10,000 and 30,000 feet, often develop into extratropical cyclones as shown in the illustrations on page 39.

strated, that the increasing symmetry of cloud patterns in mature storms, and the associated decrease in potential energy generation, may be a factor governing the ultimate intensity and eventual dissipation of such cyclones.

New View of Hurricanes

The satellite observations have been especially valuable in increasing our knowledge of conditions and processes in the otherwise data sparse tropics. James C. Sadler of the University of Hawaii found that tropical cyclones occur with far greater frequency in the eastern Pacific, off Baja California, than had been suspected. Atlantic hurricanes and Pacific typhoons have been shown to have at least two modes of formation: from a small fraction of the many disturbances that move westward (in the Atlantic, from at least as far east as the coast of Africa) in the Intertropical Convergence Zone, and from the downward growth of a small fraction of the upper tropospheric cyclonic disturbances which move westward at subtropical latitudes. The reasons why only a few of either type of disturbance become severe tropical cyclones, and so the basis for predicting which ones will, are still far from adequately understood. But the satellites have allowed us, for the first time, to determine just what disturbances are involved in hurricane formation and so have brought us several steps closer to the day when we can predict when a hurricane will form.

Studies of several seasons of satellite observations of tropical cyclones, by several scientists in a number of different organizations, have led to criteria by which the maximum wind velocity in a hurricane or typhoon can be estimated to within about 10 m.p.h. The satellite-visible criteria are the degree of organization of the cloud pattern and the size of the contiguous area of overcast. Furthermore, the structure of these systems is now somewhat better understood; initially the relatively cloud-free "moat" between the central cloud mass and the outer pre-hurricane, squall line cloud bands was felt to denote an area of extreme subsidence.



Studies by Earle S. Merritt and Raymond Wexler, S.M.'39, of Allied Research Associates, Inc., have shown this is not the case; rather, such quadrants of the storm are those with only limited outflow at near tropopause levels. This has provided a further tool for high-level wind analyses in the vicinity of hurricanes.

The weather satellite pictures have even been applied to studies and plans relating to one of man's future great adventures: the exploration of the planets. Carl Sagan and his colleagues at the Smithsonian Astrophysical Observatory made an extensive study of both TIROS and Nimbus pictures and found evidence of intelligent life on earth in less than one in 100,000, and at least two cases where apparent evidence for life was really a misinterpreted natural feature (See Technology Review, June, 1967, p. 32). Looked at in this perspective, the chances of detecting life on Mars, if it is in fact there, from the 20 Mariner IV pictures or those from similar future photographic planetary probes, are not high. Nevertheless, the experience we are developing in making and interpreting remote sensing observations of the earth and its atmosphere, from TIROS, Nimbus, E.S.S.A. and ATS, will have great value as we intensify our explorations of our planetary neighbors. And this represents a bonus over and above the primary missions of these orbiting weather observers—those of providing a better understanding, and better forecasts, of the atmosphere of greatest concern to all of us.

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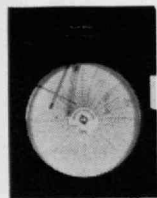
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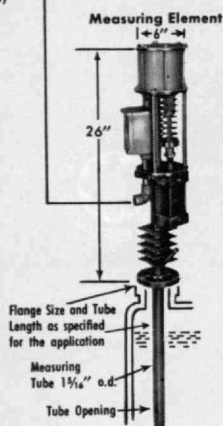
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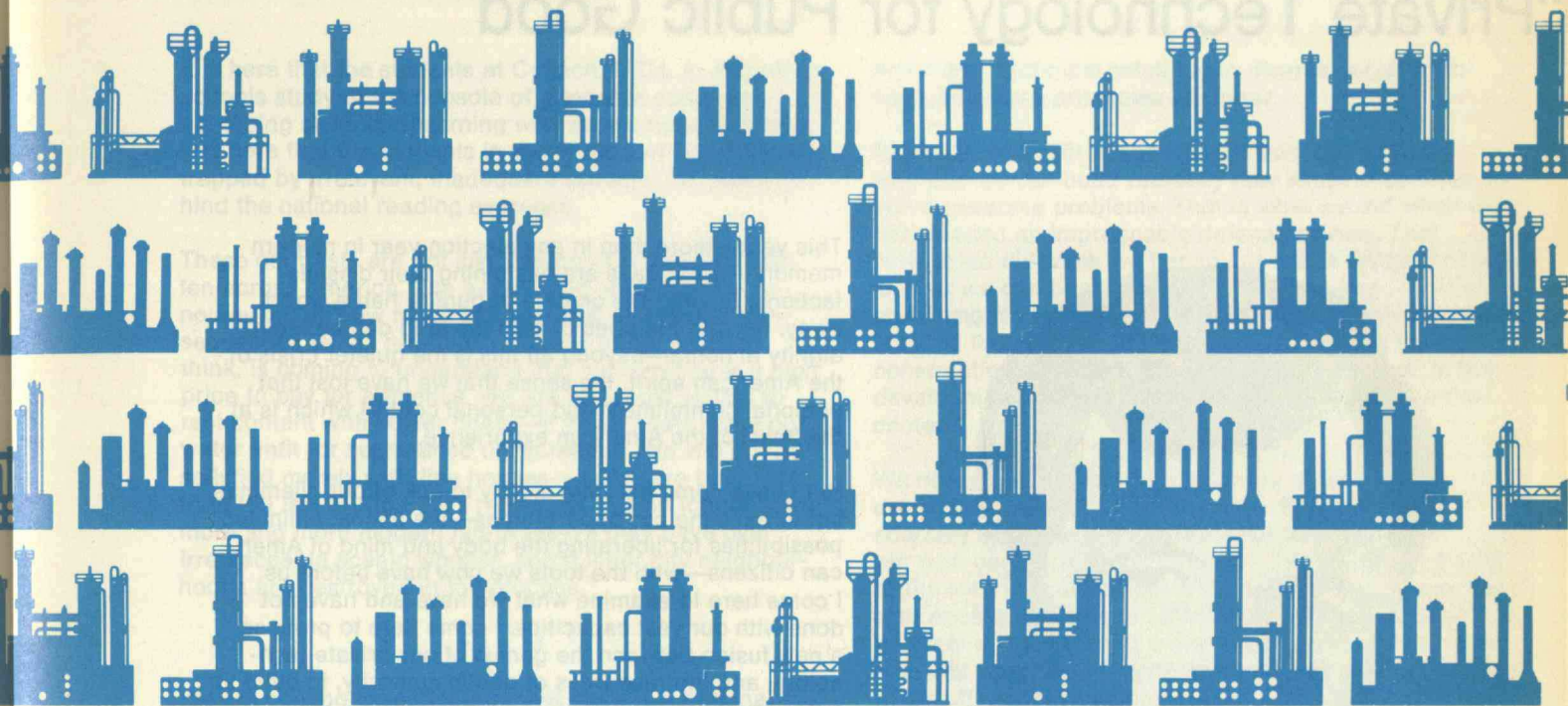
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The following are excerpts from an address by the late Senator Robert F. Kennedy to the Town Hall Meeting in Los Angeles, Calif., on April 19, 1968:

"Private Technology for Public Good"



This year—more than in any election year in modern memory—Americans are examining their dissatisfactions. Beyond the crackle of gunfire half a world away, beyond the cries of men too long denied their dignity at home—beyond all this is the quieter crisis of the American spirit, the sense that we have lost that personal commitment and personal control which is at the heart of the American experience.

But I have come here not simply to talk of our dilemmas, but to examine our opportunities—the almost unlimited possibilities for liberating the body and mind of American citizens—with the tools we now have before us. I come here to examine what we have and have not done with our vast capacities. I come here to propose a new fusion between the genius of our private technology and the resources of public authority, to build an America where the citizen is not enslaved by technological achievement but freed by it—where this resource is put to work, not simply in improving the quality of our goods but the quality of our lives.

We have already seen—here in California—what the growth of technology can bring—what it can do for us and what it can do to us.

It is here that the genius of science is building motors to power a rocket to the moon; and it is here that some of the beaches have become so polluted that many cannot be used for swimming.

It is here that planes are being built to fly men across oceans in two hours; and it is here that neglect of public transit has trapped the young job-seeker of Watts two hours away from a decent job.

It is here that the fruits of affluence have brought the automobile to millions of citizens; and it is here—60 years after the "red trolley car" took 30 minutes from city to beach—that a motorist, if he is lucky, can make the same journey in 40 minutes.

It is here that an expanding economy has given leisure so that men might enjoy their lives; and it is here that we can see overcrowding and traffic congestion—in the midst of Yosemite National Park.

As soon as he saw them, Walter H. G. Lewis, Associate Professor of Physics at M.I.T., told Peter Gwynne of the *Boston Herald Traveler*, he knew intuitively that the peaks must come from Sco X-1, the first star ever detected which emits large amounts of x-rays (see *Technology Review* Nov., 1968, p. 43). Computations later proved him right—and showed that Sco X-1 increased its x-ray brightness fourfold in 20 minutes and returned again to normal within 30 minutes. The explosion causing the flare must have had an energy of one billion billion electron volts.

It is here that the students at Caltech, U.C.L.A. and other schools study at the console of a modern computer, absorbing skills and learning with awesome speed; and it is here that the students in the ghettos of Los Angeles, trapped by irrelevant, inadequate schools, fall years behind the national reading averages.

These contrasts are not just California's; they are written across America. The benefits we reap from technology tell us how much can be done; the darker consequences tell us how much there is to do. America, I think, is coming to understand that indifference is a high price to pay for affluence. We are no longer willing to rest content with power boats—if those boats make our water unfit for sustenance or recreation. We will not be satisfied merely with fine houses—if they are built from the last of America's redwoods. We no longer want more and more modern highways—if they pave over irreplaceable scenic wonder, and if inner city neighborhoods are destroyed in the process.

* * *

We are coming to understand that there is a national agenda before us; that we must begin to arrange our national priorities so that each of us, in his own way, can help us fuse private freedom and public purpose in a new American commonwealth.

This is hard. But it is also the simplest of ideas. It requires nothing more—and nothing less—than a willingness to look at our great wealth—at our dilemmas and our capacity to solve them. And then it requires only the sense and determination to unite the two.

* * *

The most difficult—but also most important—of our tasks is to construct a method of turning private ability into the hardest of public tasks: the use of private technology for public good.

This is not easy. It requires the most careful of planning and structure to insure that we do not finance single,

monolithic technical solutions to diverse social problems. But some principles are clear.

We know that with enough public concern and resources, we can build radically new kinds of abilities, to solve awesome problems. That is what we did when we constructed an impregnable defense system. That is what we did when we began our space program. That is what we can begin to do now by directing government's influence toward new and unsolved problems: in the cleansing of our air and water, in the reconstruction of our urban transportation system, in the development of sources of recreation within our urban centers.

We now spend almost \$18 billion on research and development in public funds alone. But we have scarcely begun to put this resource to work within our own concerns. Surely this kind of incentive, offered to the men who are building for defense and space, can also encourage them to build what we need so desperately within our own cities and communities, so that men will walk on the moon and will walk with pride in the streets of American cities.

Trend of Affairs

Stars and Plasmas

The spiral structure of galaxies of stars is maintained by "density waves" that wheel around a galactic spiral disk like the pattern formed by a water stream from a rotating lawn sprinkler. The waves concentrate hydrogen gas to form brilliant young stars which, in their turn, illuminate the visible spiral pattern. The density waves are maintained by a balance between the gravitational interaction of all of the stars in the entire galaxy and the centrifugal forces generated by rotation. Thus the galaxy maintains itself through the special characteristics of the flattened spiral form which is so typical of familiar galactic photographs.

Density waves—alternate, and constantly changing, condensations and rarefactions of star concentrations—result from the collective behavior of the billions of stars that make up a galaxy. The forces involved in the waves are primarily gravitational interactions between the stars.

This theory was outlined before the spring meeting of the American Physical Society by Chia-Chiao Lin, Institute Professor and Professor of Applied Mathematics at M.I.T. It accounts for galactic structural phenomena that have been observed—but little understood—over the last half century, and the result suggests that stars in galaxies behave in ways very like single particles in electromagnetic plasmas.

Indeed, he said, "the attempt to understand galactic structures has led to a deepened understanding of these gigantic groups which may be described as nature's own laboratory of plasma physics. The density waves developed through the collective behavior of the stars seem very much like the waves known in electromagnetic plasmas, though the forces in the stellar systems are largely gravitational, while the forces in plasmas are primarily electromagnetic."

Dr. Lin, working with numerous collaborators, principally Frank H. Shu, '63, formerly of M.I.T. and now at the Harvard Observatory, used methods of statistical analysis to reconcile the density wave theory with observed phenomena. Verification of the theory and application of it to various problems in the Milky Way System and in other spiral galaxies was done using high-speed computers by Chi Yuan, Research Associate in Mathematics at M.I.T., and at the Institute for Space Studies, National Aeronautics and Space Administration, New York City.

Man's Food in Space

The generally accepted allowances for human protein requirements derive from "experience and ignorance," and so they incorporate a considerable safety factor. But when food supply becomes a critical issue, as it will for astronauts on extended space explorations, human protein requirements will have to be known to far greater precision. Research toward that end was summarized briefly by Dr. Nevin S. Scrimshaw, Head of the Department of Nutrition and Food Science, on the occasion of the dedication of M.I.T.'s new Center for Space Research.

In a 15-day test of a low-protein diet, a group of 100 M.I.T. students showed that under normal circumstances they could adapt to a daily protein intake of 0.4 grams per kilo of body weight—less than half the protein amount now recommended. But in stressful situations this low-protein diet proved inadequate; at least one-third of the students on such a diet during the week of final examinations showed a metabolic stress response for which the body could not compensate, and another third showed a response for which there was compensation within 24 hours. All the students tested succumbed to the stress of performing useful work without sleep. And all demonstrated that extra protein is required to compensate for sweat losses in men expending extra physical energy.

And the protein problem, said Professor Scrimshaw, represents one of the simplest of the "host of biological problems associated with man's prolonged sojourn in space, many of which are now only dimly perceived."

An X-Ray Flare

The first observation of a flare from an x-ray star is claimed by three M.I.T. scientists writing in the April, 1968, issue of *Astrophysical Journal*. Aside from the simply enormous size of the flare, the importance of the observation is that current theories of x-ray stars cannot account for the phenomenon.

The observation occurred during a balloon flight by the M.I.T. Center for Space Research from Mildura, Australia; a 10-million-cubic-foot balloon carried the x-ray telescope equipment to a float altitude of 26 miles for a survey of high-energy x-rays in the sky. The

peaks of x-ray radiation, amounting to a 400 per cent increase in the intensity of 20,000 and 30,000 electron-volt x-rays observed from the balloon, appeared unexpectedly in the record of a 30-minute segment of a two-and-a-half hour flight.

As soon as he saw them, Walter H. G. Lewin, Assistant Professor of Physics at M.I.T., told Peter Gwynne of the Boston *Herald Traveler*, he knew intuitively that the peaks must come from Sco X-1, the first star ever detected which emits large amounts of x-rays (see *Technology Review* Nov., 1966, p. 43). Computations later proved him right—and showed that Sco X-1 increased its x-ray brightness fourfold in 10 minutes and returned again to normal within 20 minutes. The explosion causing the flare must have produced the energy of one billion billion hydrogen bombs within a 20-minute period. Sco X-1 is in the constellation Scorpio, perhaps as much as 3,000 light-years from the earth.

The M.I.T. authors, Professors Lewin, George W. Clark, Ph.D.'52, and William B. Smith, believe theirs is the first observed example of an x-ray flare from an x-ray star. The sun, whose energy radiates largely as visible light, generates visible and x-ray flares, but both involve relatively insignificant amounts of energy. The current view of Sco X-1, as a thin cloud of hot gas generating x-rays by electron interactions at high speeds, does not provide for flaring, and so the new observations add to, rather than detract from, the mysteries about x-ray sources in the universe.

World Pictorial

The extraordinarily handsome photographs of the earth which have resulted from manned and unmanned space flights have given man a good deal of "truly scientific" information as well as a good deal of aesthetic pleasure.

Even a casual examination of the astronauts' first pictures from the Gemini flights revealed that the earth's cloud cover has a coherent pattern which represents large-scale weather effects not previously known even to exist. The extreme clarity of some of the photographs (see *right*) suggested their usefulness to geographers, and oceanographers have found pictorial evidence more accurate than charts for some of the lesser-known parts of the oceans.

More recently, infrared photography from satellites (see *page 34*) has added a new dimension by showing temperature differences in the earth and its cloud and water cover, the ground beneath great glaciers, and differences in ground cover and soil characteristics.

These and other unexpected dividends from the nation's space exploration programs were reported to an M.I.T. seminar this spring by Robert C. Seamans, Jr., Sc.D.'51, former Deputy Administrator of N.A.S.A. who is now Visiting Professor of Aeronautics and Astronautics at M.I.T. These successes, he said, have put N.A.S.A. into unexpected co-operative programs with the United Nations, with many other countries, and with many U.S. government agencies. And they have left scientists with a "horrendous" data processing problem, as useful photographs continue to pour from satellites faster than they can be analyzed.

The Himalaya mountains, as photographed by astronauts aboard Gemini V. One astronaut, looking down on a similar scene, declared that he could even see the smoking chimneys of individual houses, but N.A.S.A. officials are skeptical. (Photo: N.A.S.A.)



Computer in Space

When astronauts finally venture onto such complex missions as planetary exploration, they will need on-board computers to monitor their progress, advise them of their mission options, and estimate their chances of success. Man's special capability is to capitalize upon "unforeseen phenomena and events," but when so much hinges upon his response to the unexpected, a space explorer will need every aid to exploit his special advantages.

A concept for such aids was advanced early this spring by Charles J. Donlan, '38, and William C. Hayes, Jr., of the N.A.S.A. Langley Research Center at the A.I.A.A.'s Manned Planetary Missions Meeting in New Orleans. "The time available for experimentation on a manned planetary mission is relatively small," they said, "and the information obtained can be increased by maximizing the effectiveness of the experimental program." To this end they suggest on-board use of detailed mathematical models and on-board computers to monitor continuously the status and results of the mission and reschedule on-board activity and flight plans.

To be effective, the models must incorporate complex data—experiment analysis, flight crew skill and duty cycles, reliability analysis, on-board activity schedules, vehicle maintenance and conditions, environmental problems, expendable requirements, sub-systems trade-offs, operations analysis, evaluation of emergency provisions, and logistics support. There must be coordination of the activities of astronauts in the planetary excursion module on the surface and those assigned to the mission module which remains in planetary orbit. "The surface experimenter," say the Langley scientists, "will be concerned with selecting experimentally significant samples and obtaining measurements in a relatively small area. The program conducted simultaneously aboard the orbiting mission module, enhanced by automated satellites and probes under mission module control, is directed toward the collection of synoptic data."

One result of the Langley research is the simulated data-bank shown below—the product of extensive analysis of hypothetical conditions aboard an earth-orbiting research laboratory using a large computer complex. Neither such large computation capacity nor such elaborate data display can be expected on a planetary mission; advances in computer tech-

Component Type	Number of Components of This Type	Number of Components Needed (N)	Number of Failed Components	Number of Spares	Probability of an Unprepared Failure	Probability of Losing Function (N Failures)	Probability of Losing Alternate Model
1	1	1	0	1	0.00120121	0.001201213	0.00070494
2	2	1	0	1	0.00218105	0.000004775	0.00070494
3	1	1	0	0	0.00012016	0.000120163	0.00000000
4	1	1	0	0	0.00218105	0.002181053	0.00000000
5	2	1	0	0	0.00179052	0.000003206	0.00000000
6	3	1	0	0	0.00364298	0.000000048	0.00000000
7	6	1	0	0	0.00225991	0.000000000	0.00120121
51	2	1	0	0	0.00002730	0.000000001	0.00000000

Probability of Mission Abort Because of System 1 is 0.026474

A station efficiency check has been performed. Current status and predicted status (after a special launch) are given in the following table.

	Present	Predicted
Probability of Crew Survival	0.969	0.986
Probability of Mission Success	0.867	0.933
Per Cent Experimental Return	63.6	81.9
Efficiency Index	0.820	0.906
Special Launch Value: 4.96		

Data such as that on the chart—and greatly expanded to cover many system components and alternative missions—could be indispensable to astronauts on planetary missions. N.A.S.A. research is pointing toward an on-board computer through which to provide it.

nology will be necessary to permit faster manipulation of input-output data and better visual display. But the Langley workers expect the present experience to be "invaluable in the eventual on-board utilization of these methods."

Data such as presented on the opposite page could assist future astronauts in decisions about their experimental program and mission options during a planetary landing mission. The scheme results from computer simulation technology studies of complex systems and mission models for long-duration manned planetary exploration now underway at N.A.S.A.'s Langley Research Center.

Medical Patterns

Electronic image processing, still in its infancy, may one day help hospitals with fast, accurate analysis of blood samples and other biological specimens. As a beginning, engineers at M.I.T.'s Research Laboratory of Electronics are working on automatic machine recognition of tumor cells in Papanicolaou smears, in the counting and ordering of chromosomes in mammalian cells, and in differential white cell counting.

Murray Eden, Professor of Electrical Engineering, made an interim report on the M.I.T. work this spring at an annual review of R.L.E.'s research conducted for the Joint Services Advisory Committee and its guests.

As Professor Eden described it, the process begins with photographs—both black-and-white prints and color transparencies—made from microscope slides on which biological specimens are fixed for examination. An ultra-narrow light beam scans this photograph, and electronic circuits convert the various intensities of reflected light into digital signals. These in turn are processed through a large-scale computer, where their form is compared with programmed patterns.

The heart of the research is to develop pattern programs for the computer so that it is able to make a fast and accurate analysis of the photographic data.

When the techniques are finally perfected for medical use, the equipment will probably include a fixed electronic logic circuit—a sort of permanently wired special-purpose processor—in place of the large-scale computer. Though discrimination in biological patterns requires relatively large memory capacities, Professor Eden admitted to the Committee and its guests, new technology is reducing the costs of computer memories and "both processor and memory should be within the means of major medical centers."

Eventually, to be of value, "the system must work faster than the human," he said, and considerable refinement remains in scanning, preprocessing and memory to achieve this goal.

Still to be met is the problem of "noise." Not all slides will be perfect, Professor Eden admitted. Human observers, peering through the microscope, can recognize "noise" (imperfections) and discard it, and eventually "our system must have the logic circuitry and memory capacity to do the same thing."

Intergalactic Waves

The first observation of a nonuniform gamma ray brightness in the sky, supporting the theoretical expectation that the centers of galaxies are rich reservoirs of cosmic rays and interstellar gases, was reported by an M.I.T. research team at the dedication of the Institute's new Center for Space Research this spring.

A gamma ray is produced when a cosmic ray collides with an atomic nucleus such as those found in interstellar gases. Being uncharged, the gamma ray follows virtually a straight line from the point of its creation, undeflected by interstellar magnetic fields. Gamma rays, then, demonstrate the distribution of cosmic rays and the concentration of interstellar gases. So far, the M.I.T. detector aboard the Orbiting Solar Observatory III has recorded more than 500 gamma rays which can be ascribed to cosmic ray-particle collisions occurring in interstellar regions, and a high proportion of these have come from the direction of the center of our own Milky Way galaxy. Intensity drops off along the plane of the Milky Way on either side of the center, and there is also a marked decline in interstellar gamma ray events above and below the galactic plane, indicating that cosmic ray-particle collisions are occurring mostly within the Milky Way disk.

Co-investigators in the OSO III experiment are William Kraushaar, formerly Professor of Physics at M.I.T. who is now at the University of Wisconsin; George W. Clark, Ph.D.'52, Professor of Physics at M.I.T.; and Gordon P. Garmire, Ph.D.'62, Associate Professor of Physics at M.I.T. who is on leave this year at the California Institute of Technology.

Professor Kraushaar, initiating the gamma ray experiment, reasoned that detection of gamma rays emanating from outside the earth's atmosphere (which itself is a noisy source of gamma rays resulting from the collisions of cosmic rays with upper air molecules) could give scientists observational data on the distribution of cosmic rays and interstellar gases within the galaxy. This expectation has now been verified. What Professor Kraushaar and his co-workers cannot yet say, however, is that the events recorded from the direction of the center of the galaxy did, in fact, occur in the center and not somewhere in between. The angular resolution of the OSO III telescope is not narrow enough to pinpoint the size, shape, and distance of the most active regions.

OSO III was launched by the National Aeronautics and Space Administration from Cape Kennedy in March, 1967. Gamma ray data are still pouring from it more than a year later, and Professor Kraushaar and his colleagues hope through additional data and through additional analysis of the data already received to determine the actual abundance of cosmic rays and the interstellar gases in various regions of the galaxy.

T.W.A. wanted a new air transport in 1932—and in its simplistic specifications submitted to several potential suppliers made the assumption that there was no alternative to the then-familiar trimotor configuration. But the Douglas Aircraft Company responded with plans for a low-wing bimotor which ("with a certain amount of luck," said Arthur E. Raymond, S.M.'21, in his 1968 Gardner Lecture) met all the requirements and became the DC-1, the forebear of a distinguished lineage.

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Top speed sea level (minimum)	185 m.p.h.
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This plane, fully loaded, must make satisfactory take-offs under good control at any TWA airport on any combination of two engines.

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August 2nd, 1932

End of a Revolution?

American air transportation has come a long way from the day in the 1930's when Arthur E. Raymond, S.M. '21, flew from New York City to Kansas City between dawn and dark and, upon landing after a rainstorm, received "a liberal dose of muddy water in the face" through the aircraft ventilation system. But its future may not be so different as its past, Mr. Raymond said in delivering the ninth Lester D. Gardner ('98) Lecture of the M.I.T. Department of Aeronautics and Astronautics this spring.

Mr. Raymond was associated with the Douglas Aircraft Company for 35 years beginning in 1925—a period spanning the development of Douglas aircraft from the DC-1 to the DC-8. Of these the most famous was the DC-3, of which the company "boldly decided to arrange tooling for 50 planes," while production finally reached over 10,000. "It took us some time to

realize the full extent of the revolution brought on by our plane," was Mr. Raymond's way of putting it in his lecture.

But the end of the revolution wrought by air transportation may now be in sight. The giant jets are probably the largest aircraft which airports can reasonably accommodate, and the supersonic transports now being developed present range and hence economic restrictions which promise to limit them to a few routes where time is of highest priority. And, Mr. Raymond suggested, satellites and other communications advances may soon make a good deal of business travel unnecessary, so the demand for air transportation may not in fact continue to increase at its recent high pace. Even so, this will continue to be a growth industry, and to solve its problems air transport will have to be studied in the "complete systems sense," said Mr. Raymond, viewing ground transportation, terminal facilities, and aircraft as units of the whole.

Real-World Machines

A computer, a television camera, and a mechanical arm have now been combined into a system with enough artificial intelligence to recognize blocks of various sizes and shapes and to assemble them into structures without step-by-step instructions from an operator. The system can perceive the blocks visually, determining their size and their location on a table. It can stack them into a tower while accomplishing another goal, for example, of making the tower as high as possible with the given blocks. Or, it can be told to sort the blocks by size into neat, separate stacks.

Development of this kind of system, which was demonstrated at M.I.T. this spring, is an early stage of research on principles that will give machines engaged in routine tasks greater flexibility through their ability to see their work. Even simple vision would allow a machine to grasp one object without relying on its being absolutely positioned, or to pick up an object it had dropped, or to recognize defects.

Long range goals of work directed by Marvin L. Minsky, Professor of Electrical Engineering, and Seymour A. Papert, Visiting Professor of Applied Mathematics, envisage machines with finer and more varied visual abilities and more manual dexterity than are required for such semi-routine tasks. Work is progressing on binocular vision, color vision, the ability to perceive textures, touch sensors, improved mechanical hands and other areas whose development is necessary for accomplishing significant real-world tasks. Outlining goals such as these, especially the ability to program machines to acquire and use a substantial fund of knowledge about the real world, reveals the extent of scientific and engineering progress toward "artificial intelligence."

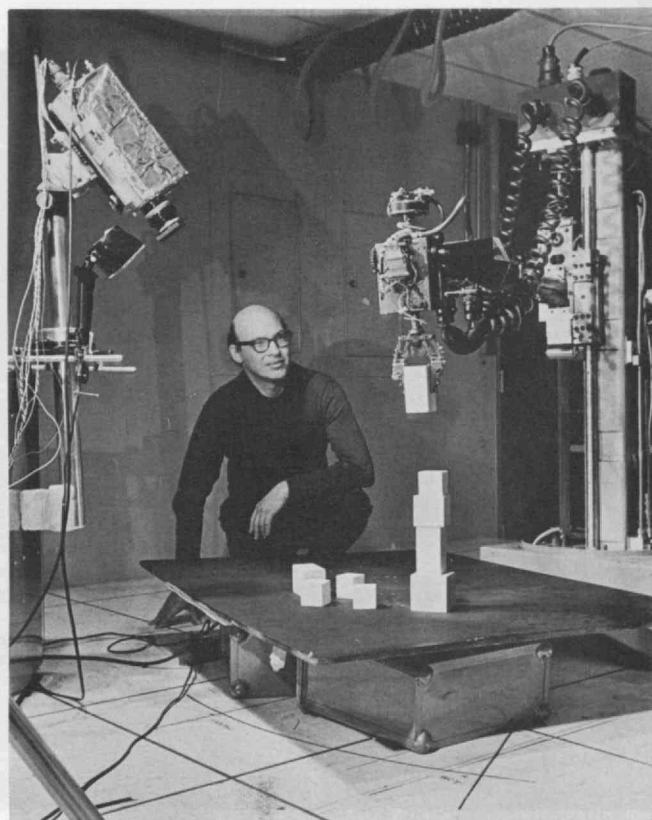
For vision, the system demonstrated at M.I.T. this spring uses "image dissector" cameras, controlled by a computer to concentrate on any desired parts of the scene before them.

For arms, the project began with a standard industrial device designed for remote handling of hazardous materials. Now a very much more advanced arm has been developed for more complex tasks; with a shoulder and three elbows, it has eight movable joints and can reach around obstacles.

The programs that analyze the visual scene have to "know" a good deal about shapes of objects, about surface textures, shadows, perspective, lighting and other aspects of the working environments, especially about how to recognize objects that are partially covered by others. The programs must also be equipped with information about mechanical stability of structures, and with general principles of problem-solving. While there has been progress in mechanizing each of these, this system is the first attempt to put all this together into one system, and that in itself is one of the most difficult of its research objectives.

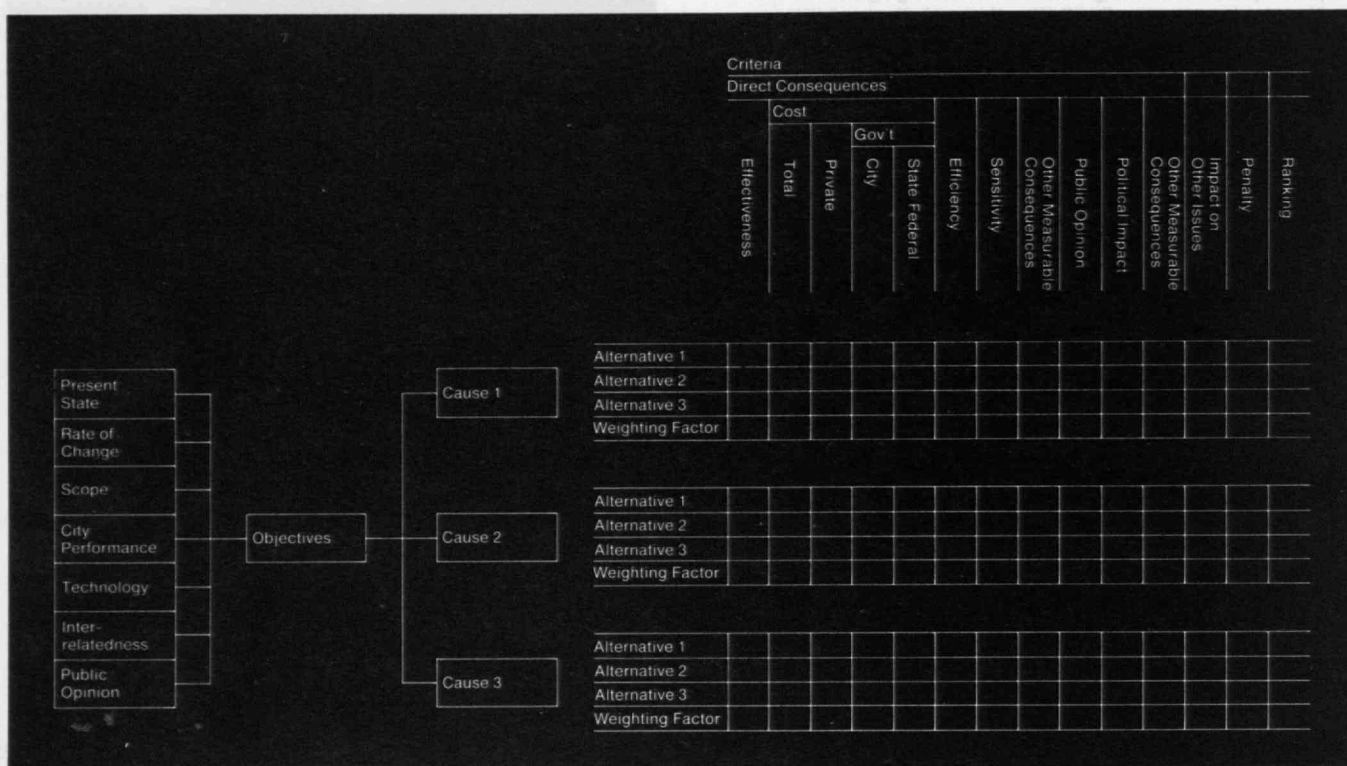
"Perhaps the central problem at the present time," says Professor Minsky, "is to increase the ability of computers to deal with mixtures of different kinds of information including general principles of problem solving. We do not like to predict how far artificial intelligence can be carried, using just the current stock

A computer, a television camera and a mechanical arm have been combined at M.I.T. into a system with enough artificial intelligence to recognize blocks of various sizes and shapes and to assemble them into structures without step-by-step instructions from an operator. The work is part of research on artificial intelligence being conducted by Professor Marvin L. Minsky (below) and his associates in the Department of Electrical Engineering and Project MAC. In the picture, the camera is at the upper left and the mechanical arm with a vise-like hand is shown holding a block to be stacked. The large-scale PDP-6 computer which is programmed to co-ordinate eye and arm is located elsewhere in the laboratory.



of ideas and programming techniques. Sometimes a problem will seem completely insurmountable. Then someone comes up with a simple new idea, or just a rearrangement of old ideas, that completely eliminates it. The degree of intelligence that a man or a machine can show depends on many qualities of the ways that knowledge, goals, and problem-solving techniques are represented and put together, and not so much on the fine details."

An "issue map" of questions, causes, and effects can help decision-makers because it presents its information in a predictable format with which its users can readily become familiar. The relationships between apparently unrelated data can then become easily demonstrable.



Mapping an Issue

A map is a very efficient device for communicating information. No matter how complex the relationships within a territory, most people can learn the essential characteristics of an unknown area quickly from a good map. This is because the interrelating factors are presented in a predictable form, and therefore a person does not have to waste time figuring out the map's basic format.

Can complex decision-making be simplified by presenting similarly predictable plots of issues, causes, and effects?

McKinsey and Company, New York management consultants, are among those who think so; and David B. Hertz, who is Chairman of the Subcommittee on Management Information for Mayor John Lindsay's Operations Research Council in New York City, described some of the techniques being used in New York City for an M.I.T. Urban Systems Laboratory seminar

late this spring. Running a city, said Mr. Hertz, is such a complex problem that "it is difficult to keep administrators effectively informed on all issues."—and this is especially true because no elected official is likely to be in office long enough to develop a backlog of decision-making experience.

The issue maps contain seven basic elements arranged on a magnetic board in a movable pattern of columns and rows to show their key interrelationships (see above). For any particular problem, the causes and sources, key facts, options, resulting effects, judging criteria, and cost-effectiveness of various solutions are all analyzed in advance by staff personnel, who then arrange these data in the format of the issue map. When the time comes, city officials study the map instead of voluminous reports for their decision-making information. In this way, said Mr. Hertz, many seemingly unrelated pieces of data can be put together to show their actual relationships, and he believes the method has already been successful in providing for its New York City users a quicker comprehension of issues and alternatives.

Mao vs. Science

The universal discord between basic and applied research has its counterpart in Communist China, and the dichotomy there is complicated by gross political interference in scientific affairs as well as by an international isolation which makes the issues hard to see and harder to understand.

Despite the devotion of Confucianism to the *status quo*—the very antithesis of most scientific progress—China historically has made important scientific contributions. But these have been isolated examples, not part of a comprehensive Chinese science in the service of definable human ends. Now it is clear that the Communist government is dedicated to a far more directed science, to teaching the Chinese people that its results can and must be made useful for man's ends, and to training increasing numbers of Chinese students for careers in this growing effort.

Yet scientific and technological progress in China is jeopardized as well as encouraged by government policy. The simplistic views of Confucianism are not dead, applied science in China remains an unsophisticated collection of technologies with applications to military or agricultural objectives, and there remains a basic conflict between expertness and utility. There are isolated examples of forward thrusts—military applications of nuclear energy, a new radio observatory, outstanding archaeological findings, and a large transistorized digital computer development. But many of these have come more despite than because of any national scientific policy, since most of the Chinese effort has been devoted to such highly practical ends as agricultural mechanization designed to bring the greatest immediate economic advance.

Upon these views two speakers at the M.I.T. Alumni Day symposium on the Technology of China Today were agreed—C. H. Geoffrey Oldham of the University of Sussex, England, and A. Doak Barnett, Visiting Professor of Political Science at M.I.T. But on the issue of political interference in China's scientific progress their conclusions were less unanimous. Clearly, said Professor Oldham, Chinese science has been set back by the cultural revolution. No one can doubt that a one-year closing of China's schools and colleges in 1966, to release young people for service with the Red Guard—from which some schools have not yet fully recovered—damaged all intellectual progress in that

nation. But other evidences, said Professor Oldham, may be overestimated. Every scientist in China is told to study the works of Mao "and use them as tools" in his work. But when the elementary political overtones are removed from these works, they turn out to be nothing but "common-sense truisms," Professor Oldham said—simply a waste of time for any mature scientific worker but not a basic threat to his integrity or understanding.

Professor Barnett's view was in striking contrast. "Mao has never accepted the culture of modern science," he told the Alumni Day audience, "and in his proclaiming the values of Communist over expert, Mao has set himself against all the forces of modernization in China." By doing so, "Mao may have won a battle, but he will lose the war," said Professor Barnett.

Ending the Arms Race

Five days before its approval by the United Nations, William C. Foster, '18, Director of the U.S. Arms Control and Disarmament Agency, told an M.I.T. commencement audience that the nuclear non-proliferation treaty was "within our grasp." Continuing his optimism, Mr. Foster then added that "there are indications also that we and the Soviets may soon be able to tackle seriously the problem of placing limitations on the strategic nuclear arms race between our two countries." The first achievement, he said, was a "giant step," marking "a true watershed in the history of this century." And the second would be "a major step toward a peaceful and stable world environment."

When you write the ideogram for "crisis" in Chinese, said Mr. Foster, you use two elements, one signifying "danger" and the other "opportunity." "I can think of nothing which better describes the strategic nuclear confrontation between today's super-powers," he said.

"Here," he said, "we have reached the situation in which neither side can launch a nuclear attack against the other without suffering a devastating retaliation—a situation in which the term "superiority" in strategic nuclear weaponry has thus become rather meaningless. But this nuclear stand-off appears to have opened up unprecedented opportunities for improving great power relationships, perhaps even for establishing a more rational world order in the process."

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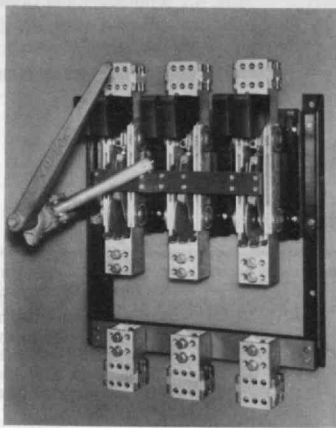
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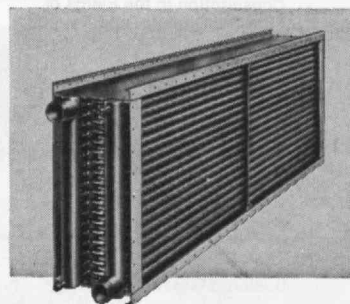
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"I Have Seen It Happen"

Education is a funny word. We think of it as being that which a student takes from his books and lectures and for which he must pay tuition. This sort of thing, we assume, is the province of a small group of rather specialized people, the students and the "educators." But education is, of course, more than that. Under one name or another, it is that whole range of experiences and encounters which cause us to grow and heighten our awareness of ourselves and our environment. It is the very business of living and relating to other people, learning those tricks and techniques that allow us to realize satisfaction and consciousness. There is no "specialist" in this field. Each of us is concerned with this kind of education, although perhaps none of us is expert. And recently, M.I.T. has witnessed a gratifying coupling of the concern of its students with this larger concept of education with an interest in the problems of urban schools and teaching within them.

That there is an active awareness and concern in the matter of human relations and development among students at M.I.T. is neither unique nor surprising. The civil rights movement brought thousands of collegians from the campus into the slums and ghettos as tutoring programs were established in every large city, and M.I.T. students were quick to organize one of the finest. In the area of central Cambridge where M.I.T. is located, the student Social Service Committee worked closely with neighborhood settlement houses and community agencies to start the Tutoring Plus project.

Teachers in Living and Arithmetic
Working at first with seventh and eighth graders, and later with both older and younger boys and girls, the tutors hoped to help the youngsters improve their performance in school, in the belief that education was the lever by which they could escape the economic and social trap in which they and their parents were caught. The magnitude and character of the problem soon became clear. Lack of motivation and enthusiasm, rather than stupidity, was the cause of much of the failure among the children in the area. Just tutoring them in their school sub-

jects, then, was really treating only a symptom of a much greater trouble. If the problem were attitude and motivation, then the tutors had to be big brothers and models, teachers in living as well as in arithmetic. By fulfilling the roles of father, big brother, friend, teacher, and guide, all at once, the tutor could influence the growth of the child, perhaps to the extent that the child could find some direction and excitement where there had been none.

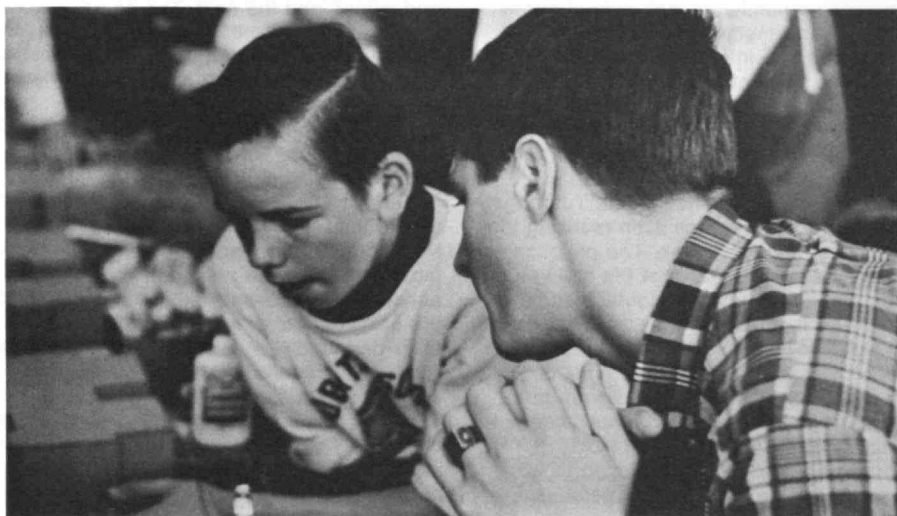
It was a tall order, but the tutors took to the job quite well. Their impact on the community was electric; grades improved, new faces and ideas were being infused into the community, and, as one tutor put it, "they would stand in the street arguing about who has the best tutor instead of who has the longest knife. I've seen it happen."

Becoming part of the life of his tutee, the tutor was inevitably drawn into the home. Encouraged by his newfound insights into the problems and struggles of his young friends, he began to look in the home for the cause of this lack of motivation. It seemed to be bred by parents, more often than not a hapless mother devoid of confidence in herself and her children. This sense of inferiority, passed from parent to child in the home, not only convinced the family that they were no good; it seemed to make the youngsters afraid to try.

Most of the lack of interest centered about a feeling of helplessness, inability to affect the world, to manipulate the environment or determine their own futures. The standard was one of non-performance; the child who tried and succeeded was the exception, and somehow, success was a mark of embarrassment rather than pride.

The attack shifted, as the tutor realized that if the family situation kept destroying the confidence he was trying to instill, his efforts would be lost. The program became centered in the home. Each tutor was obliged to try to root out the troubles of *his* family, and to try to gain the trust and influence necessary to help solve them. He was now a member of a second family, his impact that much greater.

What of these tutors? Surely such work was best done by trained people, professionals, said many. And, in some cases, they were correct. Students do not come to college fully ready to cope with the problems of their own lives, let alone those of a whole family living in an environment alien to them. But implicit in the enormous commitment in time and physical and emotional energy made by each tutor was the desire and need to involve himself with others, to learn and grow from the shared experiences he faced with his tutee and his family.



The relationships between tutor, tutee, and subject take many forms when M.I.T. students and younger residents of Greater Boston's core communities come together—but invariably the human elements in the complex equation find experiences which "heighten our awareness of ourselves and our environment." (Photos: Owen D. Franken, '68)

The tutor could not maintain such a relationship without drawing something out of it for himself. The satisfaction of living closely with others, being part of their pain and their victories, watching them, and himself, as each faced the most basic emotional problems and tribulations, kept the tutors coming back to the streets and the housing projects. They began to see that while, for many, electrons and uniqueness theorems could bore after a time, people could not. Those who succeeded and those who failed were different people for their experience. They had all "seen it happen."

A "Day Camp" for Science and Life

Through the Tutoring Plus program, M.I.T. had its first real contact with the Cambridge Public Schools. Tutors would seek out the teachers of their tutees, at the Roberts School, at Cambridge High and Latin, at Rindge Technical High. Hesitant at first, the teachers seemed slightly wary of the tutors, who had been warned that condescension and haughtiness could only get them into trouble. But as the teacher and tutor worked together on the school problems of the tutee, the initial coolness vanished; it seemed that the inexperience and enthusiasm of the tutors, and their obvious ignorance of what or how to teach children, were their saving graces. The teachers enjoyed tutoring the tutors.

Increasing familiarity with school curriculum and methods on the part of the tutors and interested faculty at M.I.T. was one of the factors leading to the creation of the M.I.T. Science Day Camp in the spring of 1965. The product of both faculty and students, the Day Camp hoped to work toward essentially the same ends as the Tutoring Plus program, perhaps even realizing the goal of college for some. The philosophy of the Day Camp was that the motivation and interest of the eighth graders could be increased if they were exposed at M.I.T. to professors and subject matter which was not taught in the schools. For the summer of 1965, 32 boys from three Cambridge neighborhoods were enrolled and eight group leaders, all M.I.T. undergraduates, were employed to work with them. The boys would spend



all day, five days per week, at M.I.T. attending classes in city planning, biology, measurements, and physics, among others, using the M.I.T. athletic facilities, and scaring the daylight out of the secretaries. The group leaders served much the same role as the tutors had; their work was done with the boys in the groups, and their impact on each boy and his family was as great as that of the tutors. The volunteer professors taught the classes, finding it much more difficult to teach a critical eighth grader than a sleepy undergraduate. The staff and uninvolved merely asked for divine guidance to see them through the ordeal.

But it was good. Good enough so that the program continued that winter on Saturdays, and the following summer and winter, and the next. The enrollment has grown to 85, the number of involved faculty and students has increased comparably. And once again, the education which came from the books and experiments, while fun and worthwhile, was merely a sideshow. Boys and men were growing together. The experience of the group leaders paralleled that of the tutors, but now the faculty, M.I.T. professors concerned with the most vital scientific research, were seeing action on a new front. A man learns from the ordeal of being almost reduced to tears on Monday by a collection of loud, rude, explosive—mean—kids tossing erasers at him, and returning on Tuesday to excite these same kids with a class which truly relates to them. He has become involved with a new kind of problem; and, regardless of the degree

of his success, he has contributed to the solution merely by his presence. He has learned, and others have learned about him. "Poor kids" become real human beings, with emotions and reactions just like the rest of us; "professors" become real as well, men who are right guys, not just stodgy eggheads. And the secretaries? Maybe they have learned more than just to close the door when the Day Camp kids are at M.I.T.

Toward an "M.I.T. High"?

The Science Day Camp brought relations between the schools and M.I.T. still closer. The Cambridge school system, traditionally conservative and slow to innovate, was beginning to introduce some welcome changes and experiments. Head Start brought the schools into closer contact with the local and federal programs in the area; the schools themselves have applied for and received money from the Office of Economic Opportunity to run an after-school program of remedial work. The School Department undertook a study to determine the weaknesses within the system which resulted in a "development," or "advancement," school, an experiment in ungraded elementary education. Rindge Tech developed a program for 13th- and 14th-year students in technical and industrial training. Students at M.I.T., made aware of the problems within the schools and of the new programs aimed at solving them, took an active interest in the possibilities of the urban school.

Their attention came to include the formal schooling of their young charges



as well as their maturation and emotional development, and it was just a matter of time before they would participate in the schools themselves.

In the fall of 1967, a small group of students and faculty proposed to the M.I.T. community a fully accredited high school at the Institute, staffed and taught by M.I.T. undergraduates and under their direction, with the teachers receiving academic course credit for their work. This rather ambitious idea attracted over 200 students and faculty, including the President of the Institute, to an organizational meeting. "Why not?" we said. "The High School Summer Studies Program has worked with high schoolers before, and we taught them formal courses there." It was true. The Summer Studies Program attracted hundreds of bright high school students from throughout the Boston area each summer to take voluntary courses taught by M.I.T. students in subjects ranging from calculus to German history.

But this was a new problem, with bigger stakes. The thought of assuming responsibility for the entire formal education of a teenager, even if the authorities would permit it, was a frightening and sobering thought. But it was exciting, and the issue was debated openly on the campus. People were talking seriously about secondary education, about what should be taught, to whom, how, and by whom. The possible role of the M.I.T. undergraduate in the Cambridge schools was discussed. How could we fit into the formal education of our tutees?

This spring, the first proposal for a new kind of educational experiment has been made by these students. It involves their being placed in the Rindge Technical High School as teaching assistants, working with members of the Rindge faculty. The M.I.T. students would assist the teacher in the classroom, helping him to give more individual attention to his students, working with him to develop the most effective solutions to particular educational problems. In addition to this work at Rindge, the students, Rindge faculty, and teachers from M.I.T., Wellesley, Harvard, and neighboring institutions would participate in seminars designed to bring out general as well as specific topics relevant to the experience at Rindge. And for their work, the student assistants would receive M.I.T. course credit.

It appears likely that some 40 M.I.T. undergraduates will take part in this program, beginning in the fall of 1968. With ruffles and flourishes, and with the blessing of both M.I.T. and the community, the tutors have become helpers in the classroom as well. And the student-staffed "M.I.T. High"? With a little experience under their belts, students at Tech might try anything.

Education Is the Domain of Every Man

The central theme of this entire involvement has been a quality hardly unique at M.I.T. The concern for education in its largest sense is one which all men share, be they young or old, wealthy or poor. Learning to live with others, to relate our own problems and needs to those of others in order that we may



understand better the actions of men, is the domain of every man. John Kennedy and Martin Luther King are dead—why I cannot begin to understand. But I think that I *can* understand, if only by learning what it is that makes people do what they do, by living and experiencing with others the whole range of human reactions and the forces which shape them. I have been told that the young have a special empathy, a special inclination for these thoughts, but I cannot agree. I have seen boys and girls, and men and women, learn and grow toward real understanding by the involvement and eagerness to participate in life which motivated each tutor to hit the street.

I know.

I have seen it happen.

Richard Adelstein, '68, prepared for M.I.T. at the Stephen T. Mather High School in Chicago. He has been a leading participant in the M.I.T. Science Camp during the summers between all of his M.I.T. years, and he will enter the Harvard Graduate School of Education next fall to prepare for a high school teaching career.

Institute Review

"One of My Heroes Is Dead!"

M.I.T.'s 1968 commencement and reunions, traditionally a time for celebrating new beginnings and old friendships, took place under the shadow of the second national tragedy in two months. The dilemma between remorse and re-joyce was never really solved, but the several thousand visitors to M.I.T. between June 6 and 10 sensed a spirit of concern and resolve in the Institute community which far transcends the traditional relationship of technology to human affairs.

The first tribute to Robert F. Kennedy came from Jerome B. Wiesner, M.I.T. Provost, who opened the baccalaureate on June 6 with the most moving episode of all: "There are no words that can express our loss or my feelings—nothing that can fill the void he leaves in our times . . . He was a symbol of hope for untold millions around the world . . . the hope that man will eventually find his way from the labyrinth . . ."

The next morning James R. Killian, Jr., '26, Chairman of the Corporation, opened the traditional commencement exercises with a reference to the "sombre sense of tragedy" which hung

over the gaily decorated hall. And Howard W. Johnson, President of the Institute, spoke of these as "days that evoke in the nation both pity and terror—the two great themes of tragedy."

Then on Sunday morning, faculty, staff, students, and alumni attending campus reunions joined in a memorial service for the man taken just as he reached "a broad sunlit expanse where he could aspire to his fulfillment," said Gregory Smith, '30, President of the Alumni Association, who presided.

"One of my heroes is dead," cried John H. J. Allum, a John F. Kennedy scholar from Buckinghamshire studying in the M.I.T. Sloan School of Management. "I implore you to continue his work . . . to end the quagmires of poverty."

"In a revolution fighters die," Dr. Wiesner said at the memorial service. Today's revolution, he said, is the struggle of "growing affluence and deteriorating cities, great medical technology held inaccessible to those who need it most, money enough to rebuild New York City wasted on war." It is the era of change brought on by technology, said Dr. Wiesner, and under its vast influence the present is already obsolete.

Finally, at a hastily organized discussion to replace a Sunday evening of singing and entertainment for campus visitors anticipating Alumni Day on June 10, Hans-Lukas Teuber, Head of the M.I.T. Department of Psychology, complained of how little man knows of himself and his motives for action and reaction. "The more we know with certainty," he said, "the more certain we are to be wrong." Dr. Benson R. Snyder, Psychiatrist-in-Chief of the M.I.T. Medical Department, spoke of "the tragedy of selective perception. A prejudiced mind," he said, "relies on simple, closed constructs to explain 'how things work.'" And when his model fails under the stress of change, such a man finds he cannot adapt, becomes furious, and seeks a scapegoat. Under modern conditions of confusion and dislocation, "how can the individual find his voice without being overwhelmed by the cacophony?" Dr. Snyder asked.

Responding, some alumni revealed their rigidities: Are aggression and violence related to permissiveness in the home? Is it not wrong to run down this country, to preserve the freedom of the Stokely Carmichaels? Law enforcement is at the center of the fabric of civilization, but are we enforcing the law?

Toward a Humane Technology

"The disparity between man's accomplishments and man's hopes" should hold your central focus, Howard W. Johnson, President of M.I.T., told over 1,100 M.I.T. graduates at the Institute's 102d Graduation Exercises on Friday, June 7.

"There is a disturbing gulf between our technological achievement and the quality of our living—our sense of community," he said. "There are innumerable social issues to which we must respond with greater commitment and effectiveness than ever before."

M.I.T. and its graduates can do so "in a wholly special way appropriate to our historic concern for humanizing technology—which is the most revolutionary spirit of change the world has ever known," President Johnson declared. This kind of challenge, he told the graduates, requires "a revitalization of professionalism—a professionalism that excludes intellectual insularity and that builds on the essential characteristics of intellectual curiosity, of basic personal integrity, and of a selfless concern for human and humane results."

Thus, he said, these exercises speak especially of "the promise that learning holds for improving man's life on earth."

Two Degrees at Age 16

Don B. D. Zagier is the youngest member of M.I.T.'s Class of 1968. At age 16, having spent two years at M.I.T., he received two S.B. degrees on June 7—one in mathematics and one in physics—and proceeded immediately to England for graduate work at Oxford University. Don Zagier came to M.I.T. with advanced credit as a result of independent study using M.I.T. texts during a first year of college at Winchester, England, spent



Heading for the Baccalaureate, the first principal event of M.I.T.'s Commencement Weekend, Clark Kerr, Chairman of the Carnegie Commission on Higher Education, and Howard W. Johnson, President of M.I.T. (on his right), were escorted by Richard C. Lufkin (left) and Robert L. McCrory, Jr., of the Class of 1968.



The shadow of national mourning and uncertainty under which they were conducted failed to dim the traditions of M.I.T. Commencement on June 7. More than 1,100 graduates were called to the platform by their deans or by Jerome B. Wiesner, Provost (above), to receive diplomas and congratulations from M.I.T. President Howard W. Johnson under the watchful eye of Warren D. Wells, '48, Registrar.

Commencement highlights: the traditional Commencement Luncheon in the Great Court; congratulations to Don B. D. Zagier, the youngest member of the Class of 1968, from Kjell Karlsrud of Oslo, Norway, one of its tallest; John W. Kilduff, President of the Class of 1918 greets John P. Kotter, President of the Class of 1968; and William C. Foster, '18, speaking for his 50-year class at the Commencement Luncheon.



one year as a freshman, one semester as a sophomore, and one semester as a senior.

In all, there were 1,213 M.I.T. degrees awarded at commencement to 1,131 candidates, 82 of whom received two degrees: these included 660 bachelor's degrees, 338 master's degrees, 82 engineer degrees, and 133 doctorates. Some of the thesis titles for advanced degrees ranged, as usual, upwards from the esoteric: "Methods for the Description of the Temporal Structure of the Human Electroencephalogram," by Stephen K. Burns, '62; "On the Integral Extension of Quadratic Forms," by Melvin Band; and "Contributions to Metarecursion Theory," by John M. MacIntyre, '64. Others made sense to more ordinary mortals: "Merging in Automated Transportation Systems," by Michael B. Godfrey, '64; "Long-Range Forecasting for a Consumer Durable in an International Market," by Jon S. Armstrong; and "The Use of Law as an Instrument of Social Change," by Michael D. Appleby.

Other commencement highlights of 1968 included the award of degrees to a husband-and-wife team: Daniel E. Whitney, '60, who won the Ph.D. in mechanical engineering, and Cynthia



Kolb Whitney, '63, whose Ph.D. was awarded in physics; the award of three degrees simultaneously to Joseph A. Mangano—S.B., S.M., and E.E.: and the award of degrees (including eight doctorates) to 49 co-eds.

How To Do Something for the World

Don't worry about protecting the younger generation. Worry about overprotecting them.

The greatest tragedy that can befall a student is to be delivered from mother to university to industry said John P. Kotter, '68, Permanent President of M.I.T.'s newest class, at the annual Commencement Luncheon. The tragedy, he said, is that in this case "he's never been a part of the world and the world has never seen much of him."

But when he becomes part of the world, "scorched" by reality, said Mr. Kotter, a student has two choices: he can take himself to a new Walden Pond in the manner of Henry David Thoreau, or he "can settle down and do something for the world." The problem, Mr. Kotter said, is to achieve both academic ability and insight into reality, and this is the real test of schools today.



Bridges to the Future

Howard W. Johnson, President of the Institute, told the Class of 1943 that M.I.T. alumni asked three questions when they met him during reunions in June:

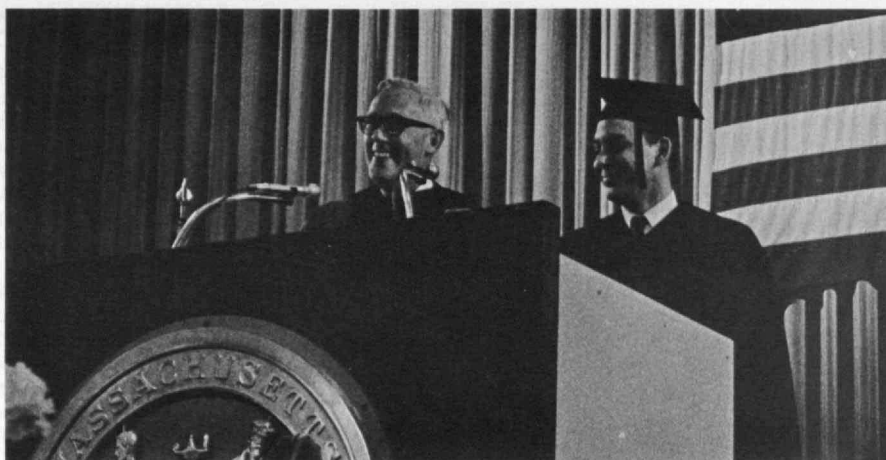
Is M.I.T. true to its trust—do we relate to the leadership of technology in the modern world?

Can we afford the growing cost of this leadership role?

And what about today's M.I.T. student—why hasn't "it" happened here?

The President's answers came in his annual report to the alumni at lunch on Monday, June 10. M.I.T., he said, is a world leader of truly modern technology in its relevance to world needs. To maintain this role, he said, it must breed among its students "reform and growth and change, and it must itself practice these within its own structure. This is what we are trying to do," he said: "To foresee the bridges that will move us to the future and then, plank by plank, to construct wisely and well."

President Johnson gave these answers to the three questions from alumni:



Special events of Commencement Week-end: Irwin W. Sizer, Dean of the Graduate School, presents the coveted Goodwin Medal to Charles L. Seltz, III, '65, a graduate student in electrical engineering who has the knack of "making potentially dry technical material into a gourmet's delight," said Dean Sizer; a silver tea service presented by the Class of 1963 to the Student Center is admired by Julius A. Stratton, '23, President Emeritus of M.I.T., Maria Kivisild, '69, President of the M.I.T. Undergraduate Association, and Henry W. Bowman, '63, President of the Class; and Frederick G. Fassett, Jr., Dean Emeritus of Residence, acknowledges the tributes to the late Mrs. Fassett at the dedication of the Julie Fassett Garden.



"We are proud of the way our graduates have been able to relate their own talent to the needs of the active world. But," he told the alumni, "we see an unending, relentless pressure on you and on our future graduates to extend these bridges of performance for mankind in still more effective ways." Our concern, he said, is to include "the psychology of motivating all men as well as the engineering of comfort."

Referring to the Institute's contributions, President Johnson cited its determination to improve the lot of urban dwellers, to extend further the traditional contributions to knowledge of basic science, to better understand the modern economic pressures of inflation and international deficit which, he said, "represent as serious a long-term test of democracy as do international pressures and explosions of race and color."

Can we afford the cost? Yes, said President Johnson, though he admitted that "we see serious pressures upon us in the years ahead." Yet he assured the alumni that these appear to be "amenable to balance, to stabilizing, to control, providing we have your continual full support."

And what of the students? Young people

today, said President Johnson, are emerging "as active participants in the major social and moral issues of our times." He believes this is "a mark of maturity which we all should welcome. For they are learning outside of the classroom as well as within it . . . extending the learning sphere to the whole environment, which is the true spirit of education."

The major challenge of the future, President Johnson told the alumni, is to maintain the unity of this new and broader educational experience with the academic experience of campus classroom. "In spite of the lure of exciting engagement with current issues," he declared, each of our students must be encouraged to spend "the time and effort to build an effective base within which he can see these issues." And for this, M.I.T. must depend upon its faculty—upon each one's "willingness to take responsibility for the learning process, on his devotion to progress, and upon his single-minded concern for quality."

For Ideals and Values

A plethora of ceremony kept M.I.T.'s dignitaries on the run during five days of commencement and alumni reunions:



Presentation of the Class of 1968 gift to M.I.T.—a welcome break from heat and ceremony was provided when the Class of 1968 opened a new lounge area on the second-floor balcony overlooking M.I.T.'s main entrance after the baccalaureate on Thursday afternoon. The class' hope is that this will be another refuge from the hectic pace of M.I.T.'s academic programs for future students—and a place to foster community conversations.

Dedication of the Julie Fassett Garden on June 7—Howard W. Johnson, President of M.I.T., received a symbolic gardener's trowel from the Fassett Foundation at the site of the partially completed garden which will serve as the Institute's memorial to the late wife of Frederick G. Fassett, Jr., Dean of Residence, Emeritus. President Johnson responded to this "symbol of a growing garden" with the hope that the completed project would "help us capture the elusive quality that we need so much—ideals of beauty, calm, and quiet elegance." Dean Fassett, saying that he "hardly knew how to put forth the varied emotions that are in me at this moment," reflected upon the basis of his affection for M.I.T.—"the stern devotion to truth, its regard for the humane and simple values of mankind."

Two additions to the M.I.T. fleet were christened during June week-end festivities—the Ralph T. Jope, '28, and the H. W. McCurdy, '22. Jack H. Frailey, Head Crew Coach, spoke at the Jope christening of the late Mr. Jope's many contributions to M.I.T. crew, and Mrs. Jope (top, center, accompanied by others in the family) performed the christening. Earlier, the honors had gone to Mrs. McCurdy, who was watched with pride by Mr. McCurdy (center, right) and M.I.T. President Howard W. Johnson; and then Mr. McCurdy (below) joined in applause for the M.I.T. crew who first boated the shell which bears his name.

The gift of M.I.T.'s one millionth book—A special feature of the Alumni Day luncheon was the gift by I. Austin Kelly, '3d, '26, of what became the millionth book in the M.I.T. Libraries—a rare first edition of *Leaves of Grass* by Walt Whitman. He chose this book, said Mr. Kelly, as a token of the increasing role of the humanities at M.I.T., and because of Walt Whitman's special concern for "young people, nature, and country,"

Presentation by Mrs. Henry G. Parker of a new painting of the Rogers Building, M.I.T.'s first home in the Back Bay—A gift of the widows of members of the Class of 1917, the large, explicit, and highly decorative oil by Albert W. Chase, '17, was unveiled in the President's Office. President Johnson said it will give everyone who enters his office "a sense of the past from which the Institute must derive much of its strength in the future."

The gift of a silver service from the Class of 1963 for the M.I.T. Student Center—Given in memory of the late James N. Murphy, the first manager of the Student Center building, the silver service was accepted for the building by Julius A. Stratton, '23, President Emeritus of the Institute whose name is carried on the building which houses the Student Center facilities.

The McCurdy and the Jope

Two proud names were renewed at the Pierce Boathouse this spring with the christening of new eight-oared shells in honor of Horace W. McCurdy, '22, and the late Ralph T. Jope, '28.

At the traditional ceremonies on June 5, Mr. McCurdy recalled his own undergraduate experience as a member of M.I.T.'s first intercollegiate crew and then watched a group of today's undergraduates put the new *McCurdy* through its paces. Earlier there had been a reception in the Boathouse lounge which also bears Mr. McCurdy's name as one of the staunchest supporters of rowing at M.I.T.

The new *Ralph T. Jope* was christened by Mrs. Jope before more than 200 members of the Class of 1928 (including 10 who had been oarsmen as undergraduates) and was then boated by a special alumni crew on Sunday, June 9, Ross H. Smith, Head of the M.I.T. Department of Athletics, recalled that Mr. Jope was "in effect M.I.T.'s first director of athletics," and Jack H. Frailey, '44, said, "It's good to have a *Jope* in the Boathouse again."



Corporation Elections

Six members have been named to new assignments on the M.I.T. Corporation—Irenée du Pont, Jr., '43, as a Life Member; Frank R. Milliken, '34, and Thornton A. Wilson, S.M.'53, as Special Term Members; and William E. Hartmann, '37, Henry E. Singleton, '40, and Gregory Smith, '30, as Alumni Term Members.

Mr. Du Pont is Vice President and Director of the E. I. du Pont de Nemours and Company—a firm with which he has been associated since 1946. He studied mechanical engineering at M.I.T., and he has been a Special Term Member of the Corporation since 1963.

Mr. Milliken rejoins the Corporation after serving as an Alumni Term Member from 1962 to 1967; he is President of the Kennecott Copper Corporation.

Mr. Wilson, President of The Boeing Company, came to M.I.T. in 1952 as a Sloan Fellow for study in the Sloan School of Management. His earlier degrees are from Iowa State University and the California Institute of Technology.

An architectural graduate from the Institute, Mr. Hartmann is General Partner associated with the Chicago office of Skidmore, Owings and Merrill. Following his M.I.T. study, Mr. Hartmann held the Institute's Rotch Traveling Fellowship in architecture for 1939-1940.

Dr. Singleton holds three M.I.T. degrees, S.B., S.M., and Sc.D., in electrical engineering. He is Chairman of the Board and Chief Executive Officer of Teledyne, Inc.

Mr. Smith joins the Corporation as an Alumni Term Member upon completion of his service as President of the Alumni Association; he is President and General Manager of the Eastman Gelatine Corporation.

Alumni Giving: A Record Year in 1968

Substantial gifts from the principal reunion classes and the prospect of a record Alumni Fund in 1968 brought cheers to the annual Alumni Day luncheon on June 10.

Howard L. Richardson, '31, Chairman of the Alumni Fund Board, reported a total as of that date of over \$2,100,000 from over 17,000 donors. And the Fund Board, he said, "confidently expects to announce a record year in every

category" by the close of business on June 30.

Today's college graduate, said Clark Kerr, Executive Director of the Carnegie Commission on Higher Education, at the M.I.T. baccalaureate, is better trained than ever before; and he takes to his employment an appropriate demand for more responsibility and a larger role in decision-making. "The major cause for concern," said Dr. Kerr, "is that a few students—in fact, very few—have embraced illegality, intolerance and violence. They are a threat that can, should and will be rejected," he declared.

category" by the close of business on June 30.

The Class of 1918 celebrating its 50th Reunion, reported a five-year total reunion giving of \$178,686, with upwards of 95 per cent of its classmates participating, a record for any M.I.T. 50th anniversary class. Not included in the gift, but separately announced, was that 30 members of the Class had included the Institute in their estate plans, which would result in M.I.T. receiving more than an estimated \$1,230,000 in future years; this represents 13 per cent participation, another record for any 50-year class. The announcements were made to the cheers of more than 1200 alumni by John W. Kilduff, President of the Class and its Class Agent.

For the 40-year Class of 1928, James Donovan, Reunion Gift Chairman, reported a total of \$411,444 from 83 per cent of the active members of the Class—a record participation for 40-year giving. A forest of red umbrellas was unfolded by his classmates when Mr. Donovan made his announcement.

Edmund R. Swanberg, Reunion Gift Chairman for the 25-year Class of 1943, announced that his Class had achieved \$206,368. In all, the reunion gifts amounted to just under \$800,000.

Into the Inner Sanctum

Today's college students have had a greater impact on their campuses than any of their predecessors, but if they succumb to the new ideology of "repressive tolerance" their generation may be "as threatening to our society as our authoritarians" of earlier years, Clark Kerr, Chairman of the Carnegie Commission on Higher Education, told members of the Class of 1968 and their parents in the baccalaureate address on June 6.

Dr. Kerr defined two eras in the relationship of students on their institutions.



The first, he said, was the development of extracurricular interests—the era of the "big man on campus." Today, however, is an era of far greater significance. Traditionally, he said, "students have stayed outside the inner sanctum of the university and inside its gates. Now they are moving to get into the inner sanctum and outside the gates."

"Life Is Just a Bowl of Cherries" has given way to "We Shall Overcome." From this ferment, the Class of 1968 leaves on their campuses legacies "that can surpass those of an earlier generation": an increased interest in academic reform, a growing concern for administrative participation; demands for greater freedom in students' private and political life, a focus of concern for the relationship between academic and public affairs, an "enormous" interest in community service, and a new image of their generation which derives from the picket sign and their nonconformist exhibitionism.

To the world into which they move, the Class of 1968 will bring this reuse of activism—a need to participate in decision-making, a demand for more interesting and responsible roles.



Irenée du Pont, Jr., '43



Frank R. Milliken, '34



T. A. Wilson, S.M., '53



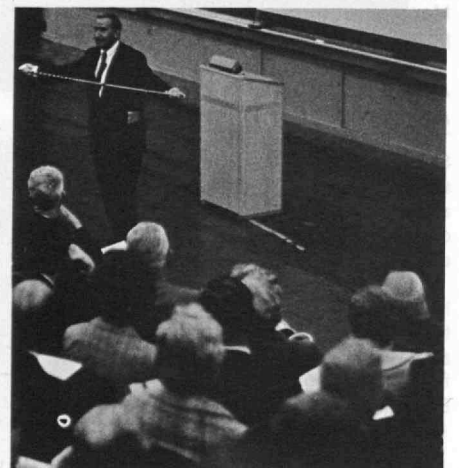
W. E. Hartmann, '37



Henry E. Singleton, '40



Gregory Smith, '30



More Commencement Week-end highlights: a cheer from the Class of 1943 at the Alumni Day luncheon; Brigadier General Leo A. Kiley, '39, awards commissions to R.O.T.C. graduates; "You are my sunshine . . ." by a faculty "combo" including Professors Theodore Wood, Harold E. Edgerton, Sc.D.'31, and John E. Ward, '43, at Graduation Eve; the 50-year class of 1918 in the Academic Procession; James O. McDonough, '43, registers for Alumni Day; Hans-Lukas Teuber, Professor of Psychology, at an Alumni Day seminar . . .



... the red umbrellas of the Class of 1928 unfurled to announce the Class Gift of \$411,444 at the Alumni Day luncheon; John W. Kilduff, '18, presents the 1918 Class Gift to M.I.T. President Howard W. Johnson; Warren K. Lewis, '05, Emeritus Professor of Chemical Engineering, uses the famous index finger with Julius A. Stratton, '23, President Emeritus, at the Alumni Day luncheon; Gregory Smith, '30, President of the Alumni Association, and James R. Killian, Jr., '26, Chairman of the Corporation, on the Alumni Day luncheon podium; and two views of the informal reunions that are the heart of every Alumni Day.

"Most of these impacts on the campus and on society will be good," said Dr. Kerr. But he warned of grave concern about "a small but growing group of students willing to resort to illegal methods, turning to intolerance and violence. This" he said, "is the road to ruin, for the campus depends on goodwill. And for a democratic society, these views require less democracy and more force."

The Profession of Peace

Twenty-three M.I.T. students were cited for commissions in the U.S. military services upon completion of R.O.T.C. training and M.I.T. academic requirements at exercises opening M.I.T. graduation ceremonies on June 6. As officers, they must be prepared for "responsibilities far beyond those of other young men of your age," the new officers were told by Brigadier General Leo A. Kiley, '39, Commander of the Air Force Office of Aerospace Research, who delivered the principal address at the Joint Commissioning Exercises in Kresge Auditorium.

"There is more to the military than participation in the art of war," General Kiley said; indeed, he declared, "peace is our profession" in the military today, and the qualifications that count include intellect, passion, imagination, high moral fiber, integrity, and patriotism. And especially, he said, "never in the history of the military has it been so vitally important to have in uniform scientists and engineers who understand the capabilities and limitations of technological progress."

Two of the R.O.T.C. graduates were designated for commissions in the Regular Army, three in the U.S. Navy, and two in the Regular Air Force. Other commissions were in the reserves of the three services.

Faculty Promotions

The coveted honor of full professorship came to 22 members of the M.I.T. faculty on July 1, when their promotions from associate professor became effective. In addition, 41 members of the faculty achieved the rank of associate professor in the annual list of promotions released at the Institute during the spring. Full professors are:

Ali S. Argon, Sc.D.'56, Mechanical Engineering
George Bekefi, Physics
William Bertozzi, '53, Physics
Sylvain Bromberger, Humanities
Donald C. Carroll, Ph.D.'65, Management
Eugene E. Covert, Sc.D.'58, Aeronautics and Astronautics
Ernst G. Frankel, S.M.'60, Naval Architecture and Marine Engineering
Carl W. Garland, Chemistry
Leonard A. Gould, '48, Electrical Engineering
Frederick C. Hennie, 3d, '55, Electrical Engineering

Icko Iben, Jr., Physics
Justin E. Kerwin, '53, Naval Architecture and Marine Engineering
Robert E. MacMaster, Humanities
James E. McCune, Aeronautics and Astronautics
Walter McKay, '34, Aeronautics and Astronautics
Frederic R. Morgenthau, '55, Electrical Engineering
Herbert H. Richardson, '53, Mechanical Engineering
Augustus R. Rogowski, S.M.'28, Mechanical Engineering
William F. Schreiber, Electrical Engineering
Campbell L. Searle, S.M.'51, Electrical Engineering
Arthur C. Smith, Electrical Engineering
Emily L. Wick, Ph.D.'51, Nutrition and Food Science

Promoted to associate professor are:

Arthur E. Bergles, '57, Mechanical Engineering
Hale V. D. Bradt, Ph.D.'61, Physics
John F. Breedis, Metallurgy
John B. Bronzan, Physics
Joel E. Brown, '59, Biology
James D. Bruce, Sc.D.'64, Electrical Engineering
Wilfred E. Chassey, Athletics
Franklyn M. Clikeman, Nuclear Engineering
C. Allin Cornell, Civil Engineering
Charles K. Crawford, '59, Electrical Engineering
Michael L. Dertouzos, Ph.D.'64, Electrical Engineering
Lawrence B. Evans, Chemical Engineering
William R. Ferrell, '60, Mechanical Engineering
Victor W. Guillemin, Mathematics
David M. Hercules, Ph.D.'57, Chemistry
Charles E. Holt, 3d, Ph.D.'62, Biology
Phillip Isenberg, '57, Nutrition and Food Science
Arthur D. Kaledin, Humanities
Elmer E. Larrabee, S.M.'48, Aeronautics and Astronautics
Walter H. G. Lewin, Physics
Marvin L. Manheim, '59, Civil Engineering
Chiang C. Mei, Civil Engineering
Peter J. Pahl, Sc.D.'64, Civil Engineering
Allan D. Pierce, Ph.D.'62, Mechanical Engineering
James E. Potter, Ph.D.'62, Aeronautics and Astronautics
John S. Saloma, 3d, '56, Political Science
Herbert D. Saltzstein, Psychology
Peter H. Schiller, Psychology
Ethan R. Signer, Ph.D.'63, Biology
Robert W. Simpson, Ph.D.'64, Aeronautics and Astronautics
Nathan Sivin, '52, Humanities
Ain A. Sonin, Mechanical Engineering
Chester L. Sprague, M. Arch.'58, Architecture
David P. Taylor, Management
William I. Thompson, Humanities
Jay R. Walton, Civil Engineering
Thomas F. Weiss, Ph.D.'63, Electrical Engineering
Leon S. White, Management
George M. Whitesides, Chemistry

Robert B. Williamson, Civil Engineering
Richard K. Yamamoto, '57, Physics

Toward a "Steady Pulse"

The Center for Space Research, M.I.T.'s newest interdisciplinary laboratory, which operates under the direction of John V. Harrington, Sc.D.'58, Professor of Aeronautics and Astronautics, had its special day on April 25 when the new building into which the Center moved late in the winter had its formal dedication. James E. Webb, Administrator of the National Aeronautics and Space Administration, was principal speaker at the dedication luncheon, and there was a morning session at which principal research activities were reviewed by their faculty directors.

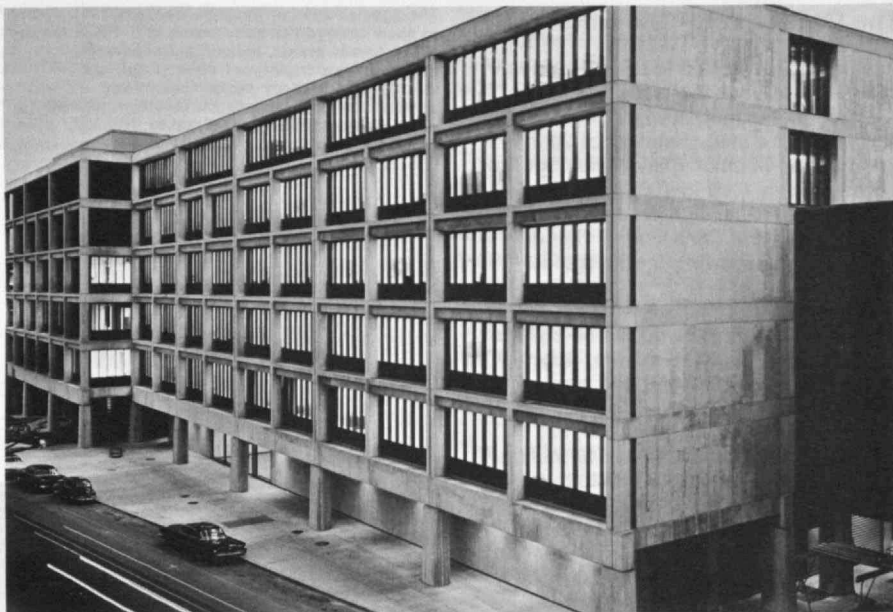
In his luncheon address, Mr. Webb admitted that the U.S. space program is being somewhat decelerated, with the result that the Russians are now devoting twice the proportion of their gross national product to space exploration than is the U.S. But, he said, institutions such as M.I.T. by their continuing research will, despite this imbalance, assure "that we have the capability to do what has to be done." Indeed, Mr. Webb suggested, basic research may be more important now than "if we were going ahead with the original plans for many space flights and for planetary exploration."

In response, Howard W. Johnson, President of M.I.T., assured Mr. Webb that "we have our eye on the long run, the long reach." M.I.T.'s role, he said, is to support the "steady pulse" of American scientific enterprise.

Earlier, at the morning session of the dedication program, Bruno Rossi, Institute Professor and Professor of Physics, noted with pride that every field of space research except optical astronomy is now represented at the Institute; and there are plans to enter that field "in the near future," he said. Recalling the rapid advance of man's knowledge of space, Herbert S. Bridge, Ph.D. '50, Professor of Physics, described the results of research to study the solar wind around Earth, Venus, and the Earth's moon, which in turn have revealed heretofore unknown aspects of the bodies whose environments were being studied. William L. Kraushaar, Professor of Physics at the University of Wisconsin, reported new results from work which he initiated while at M.I.T. before 1967, pinpointing the sources of cosmic rays (*see Trend of Affairs*).

Eugene B. Skolnikoff, '49, Associate Professor of Political Science, emphasized the importance of research on the economic and social impact of the space program which is included in the activities of the Center for Space Research. Political and technological considerations are inseparable, he said, and the recognition of this fact by the Center will have a "profound effect on the future development of

Governor John A. Volpe of Massachusetts and James E. Webb, N.A.S.A. Administrator, honored M.I.T. by attending the spring dedication of the Center for Space Research (right). Governor Volpe (right, below) gave Mr. Webb a certificate of Massachusetts' appreciation for his leadership of the space program, and at the dedication luncheon Mr. Webb told his M.I.T. audience that N.A.S.A. owes a debt to educational institutions for their contributions through fundamental scientific knowledge. (Photo left: Alan M. Goldberg, '69)



M.I.T." And Nevin S. Scrimshaw, Head of the Department of Nutrition and Food Science, described several M.I.T. studies of human metabolism spawned by space program needs which have revealed scientific information of far broader application (see *Trend of Affairs*).

John A. Volpe, the Governor of Massachusetts, was a surprise visitor at the Space Center dedication, saying in a brief address that M.I.T.'s "force for imaginative and creative thinking" is a major factor in a community and state that "are fast becoming space-oriented."

The new building for M.I.T.'s Center for Space Research, located on Vassar Street adjacent to the Sloan Metals Processing Laboratory, was made possible by a \$3 million facilities grant from N.A.S.A.'s Sustaining University Program and by \$1.3 million in gifts subscribed during M.I.T.'s Second Century Fund. The six-story building (100,000 square feet) was designed by Skidmore, Owings and Merrill, architects-engineers of Chicago, Ill., and built by Jackson Construction Company of Boston, general contractors.

Faculty Compensation

M.I.T.'s faculty salaries rank seventh highest in the nation in the 1968 survey of compensation conducted by

the American Association of University Professors, after (in descending order) Harvard, Johns Hopkins, the University of Chicago, California Institute of Technology, Stanford, and the Claremont (Calif.) Colleges.

On a scale from AA to F, M.I.T. rates A for full professors and associate professors and AA for assistant professors and instructors, indicating average compensations of \$20,560, \$13,140, \$11,610, and \$8,710, respectively. Summarizing its national survey results, the A.A.U.P. notes that faculty salaries nationally have risen 7.4 per cent in the past year; but, although recent increases have come at "an unprecedented rate," inflation has reduced their effect so that on the average college professors are still on the edge of "being exploited by society."

Kennedy Scholars

Four of the 13 Kennedy Scholars appointed in the United Kingdom for 1968 will attend M.I.T.: B. B. Horton (from Imperial College, London) and R. E. B. Lucas (from the London School of Economics) to study economics, Marilyn Lord (from University College, London) to study mechanical engineering, and J. D. Porteous (from Oxford University) to study city planning. Nine of the scholars (all of whom benefit from funds established as a British memorial to John F. Kennedy) will attend Harvard.

Alumni Seminar, November 9-11

The new implications of computers for man's daily affairs and for such large issues as individual protection and privacy will be the subject of the 1968 M.I.T. Alumni Seminar, to be conducted at the Institute for several hundred alumni on November 9, 10, and 11 under the general direction of Carroll L. Wilson, '32, Professor of Management.

Focusing on computer-based services and their impact on the structure and operation of society, the seminar will include a nontechnical survey of modern information system technology, projections of technological capabilities, predictions of future computer-based services, and a study of public policy and personal impacts which these new developments portend.

Among speakers already confirmed are Gordon S. Brown, '31, Dean of the School of Engineering, Robert M. Fano, '41, Director of M.I.T.'s Project MAC, Joseph C. R. Licklider, Professor of Electrical Engineering, and Richard G. Mills, '54, Director of Information Processing Services at M.I.T.

The Alumni Seminar, traditionally held early in September each year, is being delayed until November, 1968, so that alumni participants may more fully share in campus life as well as in the Institute's many computation facilities.

The Decline of Private Gifts

Private support for 50 leading American colleges and universities declined in 1967 for the second straight year, according to the annual survey of John Price Jones Company, and "much of the decline" from 1966 to 1967 "can be attributed to lower figures reported by M.I.T.," said *The Chronicle of Higher Education* in reporting the annual survey figures.

John Price Jones showed the 50-college totals for 1967 as \$416 million, down from \$444 million in 1966 and from \$490 million in 1965. M.I.T.'s 1966 gift total was more than \$40 million, but this fell in 1967 to less than \$18 million. The Institute's 1966 figure included a \$15 million bequest from the late Alfred P. Sloan, Jr., '95, and another nonrepetitive \$8 million gift. In 1967 M.I.T. stood tenth among the 50 institutions surveyed, topped by Harvard, Yale, Cornell, New York University, Stanford, Columbia, and the Universities of California, Chicago, and Pennsylvania.

The California Electric Special

Caltech engineering students have challenged M.I.T. to a transcontinental electric car race in August, and it may turn out to be one of the major tactical errors in the recent history of the California Institute of Technology.

According to the rules, each car is to travel from the front entrance of its own institution to that of the opponents', and the best total elapsed time will determine the winner. The start at each end of the route will be at 12 noon on Monday, August 19.

Each team will develop its own vehicle to comply with all state and federal requirements, will make its own arrangements for battery recharging en route, and will choose its own transcontinental route based on such factors as climate, road conditions, charging facilities, and distance. Towing or pushing will add a five-minute penalty per mile to the elapsed time; there will be a 30-minute penalty for charging with power not obtained from an electric power company and a five-hour penalty for replacing batteries.

The Caltech vehicle is understood to be a converted Volkswagen micro-bus using lead-acid batteries and cruising at about 50 miles an hour. But the M.I.T. vehicle will be different—"perhaps the first car designed specifically as a high-speed, efficient electric automobile," writes Norman L. Marx, '71, in *Tech Engineering News*. Its design has been the special project of Associate Professor Richard D. Thornton's (Sc.D.'57) electrical engineering laboratory course this spring.

The M.I.T. design begins with a narrowed Corvette frame, on which is to be mounted a streamlined sheet metal and fiberglass body designed for a drag coefficient of about 0.25. Sixty-pound

The special point of Parents' Weekend 1968 was to show college life as it "really is." There were a few formal events, including a chamber music concert (right), but most of the day was devoted to lively discussions of key campus issues with students, faculty, and their parents. (Photos: Owen D. Franken, '68)



permanent-magnet motors, mounted in each rear wheel, will generate 50 horsepower each; their design follows a prototype developed in a master's thesis by Charles K. Erdelyi, '66. Control is to be accomplished by high-speed high-power switching transistors, and the driver's instrumentation will include an electric speedometer and a "charge meter" to show the power consumed since the last recharge. Lead-acid or nickel-cadmium batteries—about 2,000 pounds of them, in all—will be used, and the choice is still indefinite.

"Feel Free to Ask Anything"

Over 500 parents who visited M.I.T. on May 3, 4, and 5 may have learned more about how and what today's college generation thinks than they will from their own representatives of it during the whole summer vacation. For the program of M.I.T.'s Parents' Weekend 1968 was marked by unique informality and candor in its effort to portray what college life is like today.

There were some conventional features—a production of Ben Jonson's "Epicene" by the M.I.T. Dramashop on Friday evening, an Invitational Jazz Festival on both Friday and Saturday evenings, athletic events on Saturday afternoon, tours of the Institute buildings, luncheons with deans and members of the faculty, and the 1968 Awards Convocation (see p. 76). But special interest centered on two series of seminars—

in the morning on educational philosophy and programs and in the afternoon on such thorny nonacademic questions as activism, student autonomy, drugs, and selective service.

"Feel free to ask anything," Melvyn P. Basan, '69, said in opening the afternoon panel of students and faculty on "Drugs." They did: "To what extent," said one student panelist, "is the individual bound to remain part of this world?" And a parent: "How can you advise a fellow-student to change his life by so changing his perceptions?"

To which Melinda Bird, '70, a panelist, responded with a statement about "repressive orientation"—our society she said, "negates any possibility of a genuine fulfillment experience."

Meanwhile, at another panel discussion, Kenneth R. Wadleigh, '43, Dean of Student Affairs, was reassuring the parents that "we still have a very small amount of *in loco parentis*." And, he said, M.I.T. intends to keep it, in response to "an unspoken expectation" of parents—and especially of parents of freshmen. Then a student panelist asked if M.I.T. must "force students to comply with laws they do not respect."

Taken as a whole, it may have been the first time in history that parents, students, and faculty have come together for such outspoken exchanges on such thorny issues at the Institute.



Back Bay community leaders joined M.I.T. staff, students, and alumni this spring at an all-day conference of the alumni and student Interfraternity Conferences to review the problems of the Institute's fraternity system. The chairman was D. Reid Weedon, Jr., '41 (left, above), Chairman of the Alumni Interfraternity Conference. (Photos: Owen D. Franken, '68)



Fraternities—Problems and Prospects

As fraternities enter an era of growing competition for student membership and loyalty, the Institute has reaffirmed its basic support of the fraternity system and its pledge to help fraternities maintain their autonomy. And students and alumni, organized through the Interfraternity and Alumni Interfraternity Conferences, have pledged a co-operative effort to help assure the fraternities' increasing effectiveness as parts of the Institute's residential plan.

These were the principal results of an all-day workshop conducted for 110 alumni and student members and representatives of the two groups at the Institute on May 11. With formal sessions and workshops, the day provided a preliminary view of the problems and opportunities of the M.I.T. fraternity system.

The session was opened by three leaders in the Back Bay community, where most M.I.T. chapter houses are located—Daniel J. Finn, Director of the Office of Public Service, Daniel J. Ahearn, Executive Director of the Back Bay Planning and Development Corporation, and Lawrence Perera, President of the Neighborhood Association of the Back Bay. They stressed the district's problems as the residence for increasing numbers of students in many Greater Boston colleges. But fraternities represent a

significant element of stability in this pattern of transient residents, and M.I.T. fraternities were praised for their community relations programs. Yet there is need for still more involvement by the fraternities. Indeed, one key to the fraternities' future success may be their ability to develop significant participation in community affairs for their members as individuals as well as for the chapters as property-owners.

Kenneth R. Wadleigh, '43, Dean of Student Affairs, spoke of the "mental claustrophobia" which is said to occur in some fraternities; his comments led I.F.C. President James P. Truitt, Jr., '69, of Sigma Phi Epsilon to emphasize the fraternities' "challenge to build themselves physically and to define a new role" in the Institute community.

Because of zoning and remodeling constraints in the Back Bay, many fraternities are considering moving to alternative sites nearer the campus; and five fraternities announced at the meeting the creation of a consortium to develop a program for construction of new housing for all five groups. Walter L. Milne, Assistant to the Chairman of the Corporation, warned that despite the Institute's efforts to act as "a responsible and constructive corporate citizen" there is resentment of students in some other Greater Boston communities which differs very significantly from the attitude found in the Back Bay, and fraternities contemplating moves to

other areas must take these attitudes into account. Nevertheless, more liberal zoning codes and greater land availability elsewhere may in the end encourage many fraternities to attempt this solution.

To stimulate alumni involvement, several houses are planning summer programs for active members to visit alumni at a distance from Cambridge. Fraternities plan to develop more active over-all alumni programs and to encourage alumni to designate their Alumni Fund gifts to the Independent Residence Development Fund.

Oceanography Advanced

The joint educational program in oceanography between the Woods Hole Oceanographic Institution and M.I.T. (see *Technology Review*, Mar., 1967, p. 71) was formalized in a special ceremony on board the research vessel *Chain* at Woods Hole this spring. Under the plans, Woods Hole and M.I.T. will offer six courses at Woods Hole during the coming summer, and as many as 20 summer fellowships will be available to graduate students taking them. By the spring of 1969 the two institutions will conduct a full offering of courses for one semester each year at Woods Hole and the other at M.I.T.

In the course of its deliberations, a joint committee on the M.I.T.-W.H.O.I. program has concluded that "oceanography offers graduate students the opportunity to make more expensive mistakes than many other fields." The use of ships, especially, is expensive and subject to vagaries of weather, they point out, and a careful screening and checkout program for ship-board student research will be required. Frank Press, Head of the Department of Geology and Geophysics, M. Gene Simmons, Professor of Geophysics, and Erik L. Mollo-Christensen, '48, Professor of Meteorology, are M.I.T. representatives on the committee, of which Professor Mollo-Christensen is Chairman.



On board the Woods Hole Oceanographic Institution's *Chain*, Howard W. Johnson, President of M.I.T., and Paul M. Fye, Director of W.H.O.I. (right), this spring signed a formal agreement for the two institutions to award joint doctoral degrees.

Every Wednesday

While the M.I.T.-Wellesley exchange program (see *Technology Review*, June, 1967, p. 68) does not begin formally until next fall, 30 M.I.T. undergraduates and 25 Wellesley students "jumped the gun" to enroll in classes on the others' campus this spring. And anticipation for the fall's full-scale experiment runs high.

Student groups from both schools arranged a sampling of each other's academic environment during two Exchange Days this spring which served as an enjoyable introduction to what is in store in September. The 800 M.I.T. students who went to Wellesley, said *The Tech*, were exposed to "a liberal arts curriculum and a campus with real grass in the sun," as well as to the administration's concept of "gracious living." Wellesley students had to cope with M.I.T.'s labyrinthine corridors in addition to rain, slush, computers and chemistry. The 300 girls were well-provided for, however, with information booths set up by Alpha Phi Omega, various maps, listings of points of interest, meal tickets, lists of classes they were invited to attend, and a very large number of willing guides.

Although it is doubtful that the girls contributed as much intellectual excitement in the classroom as the M.I.T. students did when they attended Wellesley—their bluntness was as refreshing as their different point of view—they enjoyed the classes considerably. An art history major who was interested in architecture had a good time investigating Baker House (from the outside—she was afraid to go in!) and a sophomore said, "This is exciting! I wish we could do it every Wednesday."

Meanwhile, a cross-registration questionnaire distributed to Wellesley and M.I.T. students by the Joint Wellesley-M.I.T. Committee revealed the full extent of interest in the program. Of the 878 Wellesley students who replied, 642 expressed interest in taking courses at M.I.T. Among the 741 M.I.T. respondents, 484 would like to register for courses at Wellesley.

Peter T. Van Aken, '63, Special Assistant in the Planning Office at M.I.T., noted that the girls expressed greatest interest in fields related to their majors, particularly the Departments of Architecture (especially art and visual arts), Electrical Engineering (mainly computer sciences), Psychology, Economics, Political Science, Humanities, and Modern Languages. Majors in the physical sciences and mathematics showed a strong interest in these M.I.T. departments. The M.I.T. students, on the other hand, proposed to branch out into literature, languages, and humanities subjects more or less unrelated to their major fields. "More positive responses than expected" came from majors in biology, physics, management, aeronautics, political science, and the humanities.

Honors Convocation

Two co-eds were among seven recipients of Karl Taylor Compton Awards—M.I.T.'s highest honor for "outstanding contributions" toward "achievement and good citizenship"—at the 1968 Honors Convocation. The Compton Awardees were Richard P. Adelstein, '68 (see page 61), a leader in community service tutoring activities; Ellen R. Greenberg, '68, General Manager of Tech Show; Karla S. Hurst, '68, a proponent of a more active role for co-eds at M.I.T.; Peter H. Rittner, '68, Editor of two student publications; Alfred A. Singer, '68, Editor in Chief of *Technique*; Stephen E. Strauss, '68, President of the Social Service Committee; William B. Zimmerman, '68, President of the Gilbert and Sullivan Society; the East Campus Seminars; and the Social Service Committee.

Three members of the staff were cited for outstanding teaching by Everett Moore Baker Awards: John C. Graves, instructor in humanities; Robert J. Kolenkow, '55, Assistant Professor of Physics; and Rainer Weiss, '55, Associate Professor of Physics. Salvatore Lauricella, manager of dining services in the M.I.T. Student Center, received the first James N. Murphy Award for an employee who has made "spirited contributions to the life of the Institute and particularly to students."

U.S.S. Cochrane

A model of the *U.S.S. Cochrane*, guided missile destroyer leader named for the late Vice Admiral Edward L. Cochrane, S.M.'20, was unveiled on April 29 in the Francis Russell Hart Nautical Museum at M.I.T. The *Cochrane* (DDG-21) was completed in 1964 and is now serving in Vietnam waters.

Mrs. Cochrane, who lives at 2 Larchwood Drive, Cambridge, participated in the ceremony, and 10 ship models from Admiral Cochrane's collection were on display. Admiral Cochrane, who died in 1959, returned to M.I.T. in 1947 after distinguished service in the Navy to be Head of the Department of Naval Architecture and Marine Engineering. He became Dean of the School of Engineering in 1952 and Vice President of Industrial and Governmental Relations in 1954.

Mathematics for Management

For his "exciting and inspiring" presentation of "Mathematics for Management" Leon S. White, Assistant Professor of Management, has received M.I.T.'s first Salgo-Noren Award for Excellence in Teaching.

The presentation, a \$1,500 cash prize and plaque, was made by Dean William F. Pounds of the Sloan School of Management, who pointed out that the course in mathematics is an introduction for graduate students to quantitative methods in management. The subject is "quite difficult," Dean Pounds said;

"bringing vitality and ingenuity to his presentation, Professor White has succeeded in making the course a popular and effective one." The award is provided by the Salgo-Noren Foundation of New York, and this year's recipient was selected by a committee consisting of Professors Paul H. Cootner, Ph.D.'53, Mason Haire, John D. C. Little, '48, and Charles A. Myers, Chairman.

Drafting Graduate Assistants

M.I.T. graduate students, already frustrated by uncertainties in their responsibilities toward Selective Service beginning this summer (see *Technology Review*, May, 1968, p. 70), received bad news late this spring: full-time graduate students who have part-time teaching assignments, like those who do not, will not be considered by Selective Service Boards for occupational deferment.

Already, Selective Service directives have made it clear that occupational deferment is unlikely for graduate students who hold full- or part-time research assistantships, Irwin W. Sizer, Dean of the Graduate School, reported. However, he emphasized the "vital" role of research assistants in "fulfilling research opportunities and obligations" and in advanced undergraduate education, and "we propose to continue making this point," he declared.

Dean Sizer also emphasized that continued service of full-time teaching assistants "is essential to the fulfillment of the Institute's teaching responsibilities, and M.I.T. takes the position that it may appropriately ask occupational deferment for full-time teaching assistants. Any other action," Dean Sizer stressed, "would impair our undergraduate education."

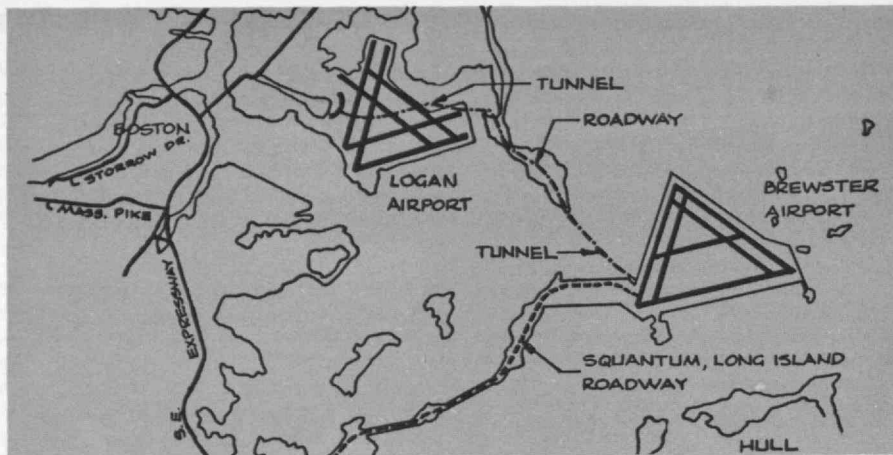
In connection with his statement, Dean Sizer summarized the responsibilities and requirements of a full-time teaching assistant under terms of M.I.T. appointments: he must devote 30 hours per week or more to teaching, student contact, and preparation for teaching; and he is permitted to register for as many courses leading to his advanced degree "which in his judgment and that of his adviser are within his capability." This is normally not more than six hours of classes per week, Dean Sizer said.

Systems Engineering in Action

While most U.S. college students end the year with final examinations, a few at M.I.T. who come to the end of studies that have all the qualities of major engineering projects make public presentations in briefing sessions which have become major campus events. This year there were three such comprehensive "systems engineering" studies, and audiences of several hundred students, faculty, and professional engineers (many of whom were invited as critics) assembled to hear about new methods of handling Boston's prodigious output of solid



M.I.T. and Wellesley had previews of their "new looks" this spring when, on two separate days, students at each institution held "open house" for the other; and both sides seemed to think the scenery improved in the result. At least 80 M.I.T. and Wellesley students will be taking courses on the other's campus next fall. (Photos: Owen D. Franken, '68)



wastes, design and feasibility studies for a major airport on the outer islands in Boston Harbor, and a remarkably comprehensive presentation of port, airport, and other urban redevelopment for Boston's entire waterfront.

In every case the students tackled on a realistic scale all the major problems that their far-reaching propositions raised, and their research took them with notebooks, cameras, and even sonar equipment to government and engineering offices, all over Logan Airport and the city of Boston, and onto most of the outer harbor headlands and islands.

Two undergraduate courses in mechanical engineering undertook a "systems engineering" review of Boston's \$4 million trash collection problem. The students made suggestions, which they said would cost \$500,000, that according to their estimates could save over \$1 million a year. The students discovered that garbage trucks spend over two hours of every six-hour shift standing still while compacting garbage and traveling to and from the city incinerator; accordingly, their plan includes redesigned trucks that can compact while in motion and—for congested portions of the city—stationary compactors to reduce the number of collections and the space devoted to storage.

Meanwhile, students in the course in civil engineering problems divided into two competitive companies—the Massachusetts Airport Development Company (Madco) and Research Associates International—to make plans for an airport in Boston Harbor. Each group conducted its own demand studies, picked its own configuration for an airport to effectively supplement the present facilities at Logan Airport, developed construction specifications and schedules, studied construction and access costs, and eventually came to the hard conclusion that Boston had better look elsewhere for new air terminal facilities. Madco said its Brewster Islands airport would cost nearly \$800 million and that an additional \$200 million should be spent at Logan to realize its full capacity in association with the new facility. Research Associates International said its plans would cost over \$800 million by 1995.

The most elaborate by far of the spring projects was Bosphorus, a Boston Port Utilization Study by an interdepartmental graduate and undergraduate group. Their task was to design airport and seaport facilities for Boston, taking into consideration "all the significant elements of interaction with the city form." They listened to lectures, consulted government and labor officials, businessmen, longshoremen, and residents, and studied reports and maps. Then they set about making the judgments and trade-offs necessary to an integrated design, seeking the "sound balance between conflicting functions, between aesthetics and function, between government and individual."

Their result, said Project Bosphorus, is a design which effectively responds "to the problems and possibilities of sea and air transportation." It included a new airport at Brewster Island in the harbor, redevelopment of Logan Airport for V/STOL craft and as industrial land, centralization of modern ship-cargo facilities at the Boston Army Base, and redevelopment for residential and commercial activities of the rest of the Boston waterfront. The job would be done, they said, by a new State Department of Transportation to co-ordinate existing and proposed transportation agencies and by a quasi-private corporation to develop and operate terminal facilities.

Bosphorus' presentation of its plans included a unique motion picture on the present frustrations and shortcomings of Boston sea and air transport. Its report will eventually be consolidated and published by The M.I.T. Press as the fourth in a series of comprehensive student-operated studies of transportation and redevelopment.

Education Research Center

Jerrold R. Zacharias, Institute Professor and Professor of Physics at M.I.T. who was instrumental in the development of the Physical Science Study Committee out of which came the P.S.S.C. high school physics courses and other projects of Educational Services, Inc., has been named Director of M.I.T.'s Education Research Center. He succeeds Robert I. Hulsizer, Jr., Ph.D. '48,

M.I.T. students in Civil Engineering Projects this spring devised the Massachusetts Airport Development Company (MADCO) to study construction of new facilities in Boston Harbor to supplement Logan Airport. Their solution was "Brewster Airport" (left), with highway connections to terminals on the South Shore and at Logan. But, they said, "the problem is extremely vast," the development would cost \$979 million, and the airport "should not be necessary if V/STOL aircraft assume a substantial part of the future short-haul traffic market."

who will devote his time to teaching and research in physics and nuclear science.

Dr. Zacharias was one of the founders of the Education Research Center, and he was its Acting Director for several months before Dr. Hulsizer joined the M.I.T. faculty in 1964. Today the Center is involved in the development of texts, films, and laboratory experiments and demonstrations in many fields of science; in preparing computer aids to learning; in devising visual representations of complex phenomena; and in studies of psychological reactions of students to the academic and psychosocial environment of M.I.T.

As Director of the Center, Dr. Zacharias will be assisted by Anthony P. French, Professor of Physics, whose responsibility will be largely with reform of course materials; Dr. Benson R. Snyder, Psychiatrist-in-Chief in the M.I.T. Medical Department, whose work will deal primarily with studies of the students and faculty in their environment; and Joseph C. R. Licklider, Professor of Electrical Engineering, who will be concerned with uses of computers in education.

"The primary intent of the Center," Jerome B. Wiesner, Provost of M.I.T. noted in the announcement, "is to provide a focal point for faculty interests in education research, to participate in the development of new educational materials, and to make available at M.I.T. a level of facilities and support which otherwise could not exist for educational experimentation."

1968-1969 Sloan Fellows

Fifty Sloan Fellows selected for advanced study in the Sloan School of Management for 1968-1969 include the first woman ever chosen for the program, Sister Anne M. O'Neil, Assistant Treasurer of Manhattanville College of the Sacred Heart, and five M.I.T. alumni: Robert B. Doane, '52, Technical Director for Command Systems, Electronic Systems Division, United States Air Force; George T. Haymaker, Jr., '59, Manager, Forecasting Division, Economic Analysis and Planning Department, Aluminum Company of America; Bruce A. Highstreet, S.M.'57, Assistant

Division Manager, Electron Dynamics Division, Hughes Aircraft Company; William C. Salmon, '57, Science Officer, International Scientific and Technological Affairs, United States Department of State; and Howard E. Wing, Jr., '53, Manager, Ship Missile Systems, Raytheon Company.

The Sloan Fellows will participate in a year-long academic program including special courses with senior members of the faculty supplemented by field visits and management seminars in which the Sloan Fellows have an opportunity to meet outstanding leaders in business and government here and abroad. To be nominated for a Sloan Fellowship is one of the highest honors that can come to a young executive, according to William F. Pounds, Dean of the School. Indeed, Peter P. Gil, Associate Dean of the Sloan School and Director of the Program, believes the caliber of Sloan Fellows is higher each year. "A growing number of new industrial and nonindustrial organizations want to give outstanding young executives in mid-career an intensive exposure to the latest developments in management and technology," he said in the announcement of the new class.

Two Sports Headliners

Spring sports at M.I.T. belonged to two headliners—Bruce Wheeler, '70, named the Most Valuable Player of the

Greater Boston Baseball League, and Ben T. Wilson, '70, whose 4:09.6 mile in the Greater Boston championships in May was a new M.I.T. varsity record.

Mr. Wheeler beat both Harvard and Boston University and set an M.I.T. record for the most wins in a season—6 out of 10 decisions in 9 starts, allowing 16 earned runs in 66 innings—all while making a grade average of 4.9 out of a possible 5 as a mechanical engineering major. But next year, seeking "a change of atmosphere," he will study at Princeton "to clear the air," he told the Boston *Globe's* Joe Con-cannon.

Technology in Health Care

M.I.T. has been awarded a \$37,000 sub-contract to assist a committee of the National Academy of Engineering in improving biomedical research and health care through modern technology. One of six universities subcontracting for the project, M.I.T. is working jointly with the Harvard Medical School to evolve concepts for relating university activities in engineering to the physical, biological, medical, social, and management sciences; identify and assess particular industrial and civic resources that can contribute to the solution of the problem; and develop plans to create among industry, the community, and the university the best combination of resources for dealing with vital medical and health care needs.

33 Years of Elegance

Thirty-three years ago, a southern plantation scene greeted guests at the first Francis Amasa Walker Assembly. Yards of smilax had been imported from Louisiana to twine in garlands around the colonnades of Morss Hall—the setting for the dance in the Walker Memorial Building.

Since that first Assembly Ball in 1935, memorable themes have transported guests to an Hawaiian garden with a 20-foot waterfall, the Circus Maximus at a Roman Court, the Hall of the Valkyrie, and a Mississippi steamboat with smokestacks and entertainment on its decks.

It all happened again in 1968 at the thirty-fourth Assembly Ball, renamed last year as the William Hamilton Carlisle, Jr. ('28) Assembly—such traditions as the red carpet and striped canopy down the front steps of the Walker Building, a champagne reception and the dance setting in Romanesque Morss Hall with columns rising three stories overhead, and the intricate Grand Promenade at the end of which all guests come together in front of the chairman of the Ball. For 500 guests, including the President of M.I.T., Howard W. Johnson, and his wife, Deans, Heads of Departments, distinguished professors, and many returning alumni of the Walker Student Staff, it was as usual the most elegant social event of the M.I.T. season.



A mixed bag of spring sports at M.I.T.: intramural water polo in the Alumni Pool; pitcher David L. DeWitte, '69, fanned 14 Brandeis players in seven innings (M.I.T. won, 14-6); and Captain Thomas M. Chen, '68 (#9), found himself wide open to make this lacrosse shot against the University of Massachusetts (but M.I.T. lost, 10-4). (Photos: Michael S. Venturino, '70, George J. Flynn, '69, and Steven R. Gretter, '71)



11 "Remarkable Colleagues"

Eleven members of the M.I.T. Faculty and staff retired at the end of the 1967-1968 academic year: Herbert L. Beckwith, '26, Professor of Architecture; Martin J. Buerger, '24, Institute Professor and Professor of Mineralogy and Crystallography; Harold E. Edgerton, Sc.D.'31, Institute Professor and Professor of Electrical Measurements; F. Leroy Foster, '25, Director of the Division of Sponsored Research; Nathaniel H. Frank, '23, Professor of Physics; Hoyt C. Hottel, S.M.'24, Carbon P. Dubbs Professor of Chemical Engineering; Egon Orowan, Professor of Mechanical Engineering; Edward S. Taylor, '24, Professor of Flight Propulsion; Walter F. Urbach, Associate Professor of Literature; Hurd C. Willett, Professor of Meteorology; and John Wulff, Class of 1922 Professor of Metallurgy. In his announcement of the plans, Howard W. Johnson, President of M.I.T., said he spoke for the entire community "in extending to each of these 11 remarkable colleagues our deepest appreciation and warmest wishes."

Professor Beckwith, a member of the architecture faculty since 1926 and Acting Head of the Department in 1956-1957, is a senior partner in the firm of Anderson, Beckwith and Haible, through which he has been co-designer of several M.I.T. buildings including the Alumni Pool, the Dorrance Building, the Whitaker Building, Rockwell Cage, and McCormick Hall. He also was associated with Eero Saarinen in the development of Kresge Auditorium and the Chapel and has designed numerous other university, corporate and public buildings throughout the U. S. and in Japan, the Philippines, Burma and Formosa. A prominent Fellow and member of the American Institute of Architects, Professor Beckwith has served as vice chairman of that organization's Committee on Education and as a member of its National Committee on the Profession; he was for 20 years Director of Exhibitions at M.I.T. and Chairman of the Museum Committee.

Professor Buerger is a distinguished pioneer in the application of x-ray crystallography, and his laboratory, from which have come x-ray instruments and systematic methods for determining how atoms are bound in crystalline form, is known throughout the world. Dr. Buerger developed the method of "image seeking functions," which employs a mathematical device to sort distances between atoms in a crystal so that the atoms fall into proper places in a pattern; he has applied the device in elucidating atomic arrangements in crystals, and research in chemistry, physics and metallurgy as well as in minerals has benefited from this work in crystallography. Professor Buerger was Chairman of the Faculty from 1954 to 1956, when he was appointed Institute Professor; and from 1956 to 1963 he served as Director of M.I.T.'s School of Advanced Study.

In a teaching career that spans 39 years, Professor Edgerton has set an

example of rapport with and concern for students, and his popularity and effectiveness are attested to by generations of alumni. His public fame rests on his development of high-speed photography, including the high-speed photographic techniques required to study atomic explosions and various aspects of deep ocean photography, and he has most recently experimented with sonar as a means of studying topographical features and sublayers of ocean bottoms.

Dr. Foster has been an active leader in the administration of academic research grants and contracts from industry and government since before World War II, when this type of activity began to assume an important role at M.I.T. Dr. Foster joined the Department of Mining and Metallurgy upon graduation from M.I.T., and in 1939 he joined the administrative staff in what was then known as the Division of Industrial Cooperation; he became Associate Director of D.I.C. in 1952 and Director in 1955. Dr. Foster will continue to serve as Director of the Lowell Institute School, a position he has held since 1959.

Professor Frank, who was Head of the Department of Physics from 1952 to 1962, has an uninterrupted association with M.I.T. of nearly half a century. Prior to his long association with the Department of Physics, he spent a year (1923-1924) as an assistant in the Department of Electrical Engineering; since then he has served continuously in physics, where his particular areas of interest have been theoretical physics and metallic conduction. During the 1950's, Professor Frank was among those active with Professor Jerrold Zacharias in the development of the P.S.S.C. physics curricula for the nation's high schools, and in recent years he has been associated with the Education Research Center on a project for re-structuring and improving vocational, technical and occupation education in American schools.

Professor Hottel, internationally known as an authority on combustion, came to M.I.T. in 1922 after graduating from Indiana University. He has been Director of the Fuels Research Laboratory since 1934 and, as Chairman of the M.I.T. Research Committee on Solar Energy, was in charge of construction of three experimental houses heated by the sun. For 10 years, he was Chairman of the National Academy of Sciences Fire Research Committee. Professor Hottel holds the U.S. Medal for Merit, the King's Medal of Great Britain, the Founders Award and the William H. Walker Award of the American Institute of Chemical Engineers, the Sir Alfred Egerton Gold Medal of the Combustion Institute, Melchett Medal of the British Institute of Fuel and the Max Jacob Award of the A.S.M.E. and A.I.Ch.E.

Professor Orowan is an outstanding authority on the physics of metals and has made significant contributions to the understanding of the behavior of solids. He is perhaps best known for the theory

of dislocations, which was introduced independently by him and Sir Geoffrey Taylor in 1934 and which has led to remarkable progress in the understanding of plasticity, diffusion and mechanical properties of real substances as opposed to ideal crystals. His research overthrew the classical theory of the brittle fracture of steel and led to the realization that the speed with which a piece of steel is deformed is the most important factor in the problem of brittleness. Dr. Orowan was awarded the Thomas Hawksley Gold Medal of the British Institution of Mechanical Engineers in 1945; the Bingham Award of the American Rheological Society in 1959; and the Carl Friedrich Gauss Medal of Germany's Baunscheische Wissenschaftliche Gesellschaft earlier this year.

Professor Taylor, a member of the Faculty of the Department of Aeronautics and Astronautics, has been Director of the Gas Turbine Laboratory since 1946. He is an authority on engine vibration, and he developed the dynamic vibration absorber which came to be used on all high-powered aircraft engines. Professor Taylor was graduated from M.I.T. in 1924 and after two years with the Wright Aeronautical Corporation, he returned to the Institute and has been here ever since.

Professor Urbach was graduated from the University of Dubuque in 1923. He came to M.I.T. as an instructor in the Department of English and History (now the Department of Humanities) in 1935 and was made a member of the Faculty in 1941. He has been a devoted and gracious teacher, with special concern for those students having difficulties with English composition.

Professor Willett, a specialist in climatic fluctuations, variable solar influences and long-range weather forecasting, was instrumental in the 1930's in the development and subsequent adoption of the polar front theory of weather prediction by the U. S. Weather Bureau for daily use throughout the country. More recently, he has been concerned with the basic patterns behind climatic conditions. Following graduation from Princeton, he spent three years as scientific observer in the Forecast Division of the U.S. Weather Bureau; in 1927 he studied in Europe under a grant of the Daniel Guggenheim Foundation, and in 1929, Dr. Willett joined the M.I.T. staff.

Professor Wulff, an outstanding teacher and a distinguished research engineer, has taken a special interest in developing undergraduate subjects such as those on the structure and science of materials. His broad interest in science and engineering is reflected in numerous publications, ranging in subject matter from optics and spectroscopy to the surface properties of metals and the flow and fracture of solids; it was in tribute to his concern for teaching and for undergraduates that he became the first Class of 1922 Professor when that appointment was announced in 1962.



Herbert L. Beckwith, '26
Professor of Architecture

Herbert Beckwith began to teach at a turning point in architectural education, when teachers began to urge their students to explore real problems as observed in the field in preference to academic exercises inherited from the past. Professor Beckwith, who from the start of his career developed professional practice in parallel with teaching, was able to transmit to students in a very effective way the attitudes necessary to solving design problems of the real world—how to gain control of the essential information, how to organize all parts of the design to make an integrated whole, how to fulfill all of the standards by which a complete professional work can be judged.

Professor Beckwith's creative work as a practicing architect continues to grow in many different locations, and it has had a significant impact on the M.I.T. campus. Through his duties with the M.I.T. Museum Professor Beckwith set a high standard for exhibitions of the visual arts; and he has also advised the Institute on countless decisions having to do with details of the physical environment.

Each of these examples bears consistent testimony to the special qualities Professor Beckwith brings to the practice of architecture. His are background buildings that form a comfortable and appropriate setting for a rich range of activities. They do not seek to make dramatic statements of form or to dominate their surroundings. All are assembled with meticulous craftsmanship and attest to a full control over the whole building process. All combine common sense with uncommon visual sensitivity.

In all these ways, Professor Beckwith's influence, exercised over several decades, has been an important factor in maintaining in our surroundings a harmonious and disciplined order and a respect for a thoughtfully designed environment.

—Lawrence B. Anderson, M.Arch.'30
Dean of the School of Architecture and Planning



Martin J. Buerger, '24
Institute Professor; Professor of Mineralogy and Crystallography

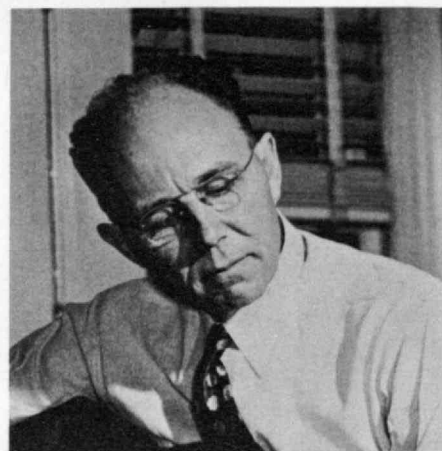
Martin J. Buerger, '24, a uniquely M.I.T. product, has been an ideal professor and has achieved an international reputation in x-ray crystallography and theoretical mineralogy. He has built one of the world's best laboratories for crystal-structure analysis by x-ray diffraction, from which have come six books and more than 180 articles; half a dozen new or greatly improved instruments; several ingenious innovations in instrumental procedures; and a steady flow of student theses—7 S.B.'s, 12 S.M.'s, and 17 doctorates.

Professor Buerger was one of the first to see the implications of W. L. Bragg's demonstration that x-ray diffraction could be used to reveal the internal arrangement of atoms in crystals. By using x-ray diffraction instrumentation and methods, he and his students have investigated such varied problems as crystal growth and habit, twinning, plastic deformation, phase transformation, reaction series, polymorphism, crystal imperfection, and general crystal-structure analysis.

Honors of several kinds—some unique—have come to Professor Buerger in recognition of his scientific contributions to mineralogy and crystallography. In 1943, after he made a trip north with famous explorer Donald MacMillan, the latter named a bay in Baffin Land, Buerger Bay, and in 1965 the Commission on New Minerals and Mineral Names of the International Mineralogical Association approved the name buergerite for a new species of sodium ferrous tourmaline.

While serving M.I.T. for the past 43 years, from Teaching Assistant in 1925 to Institute Professor (1956—), Chairman of the Faculty (1954-1956), and Director of the School for Advanced Study (1956-1963), Professor Buerger has been an outstanding teacher, a successful innovator and experimentalist, a productive author, and an active participant in the affairs of his professional societies.

—Robert R. Shrock
Professor of Geology



Harold E. Edgerton, Sc.D.'31
Institute Professor; Professor of Electrical Measurements

Harold Edgerton's shadow stretches from the bottom of the ocean to the top of the mushroom cloud. But Harold is a peaceful man . . . His super-flashes have never blinded him to a human smile, his pingers and boomers have never deafened him to a human voice. Perhaps the secret of his way of relating to students is that he can often say it with music or with action and not just with words.

To his students Harold Edgerton is a student's teacher, to his colleagues, a colleague's colleague. Harold's technical genius and curiosity have illuminated archaeology, the animal kingdom from fish to birds, golf balls, and whatever else binds each of us to him. He is the Cornhusker Renaissance engineer.

—Walter A. Rosenblith
Professor of Communications Biophysics



F. Leroy Foster, '25
Director of the Division of Sponsored Research

*At M.I.T. the D.S.R.
 Is an institution quite bizarre,
 Its operations are immense;
 It practically runs Department of Defense
 And many other government branches
 As well as various private ranches;
 Under the watchful eyes of Johnson and Killian
 It deals with funds in many a million.*

*In this vast empire the vital spark
 Has been furnished by a patriarch
 Learned in scientific ways, but also wise
 In the ways of business enterprise
 Of D.S.R., one who has weathered years
 Of stress and strain, blood, toil and tears.*

*His labs he numbers by the score,
 The mysteries of Nature to explore,
 He deals with contract negotiations
 As well as government relations.
 He even runs a Patent Section
 That has no discernible connection
 With reality; but now all good things
 Must yield to what time's passage brings.*

*For time's march is inexorable
 And the rules are inflexible.
 And our Director, whom we know as Doc,
 Soon will turn the key that will unlock
 The door that opens to a path that leads
 To a life of lesser strain and greater ease.*

*So here's to Foster, F. Leroy,
 We thank him for the good things we did enjoy,
 And extend to him our wishes for a wealth
 Of future years of happiness and health.*

—Melvin R. Jenney, '21
 Patent Counsel, M.I.T.



Nathaniel H. Frank, '23
Professor of Physics

When I came to the Institute in 1930, I was told by Julius Stratton, '23, H. B. Phillips, and others that there had been a great deal of activity during the preceding several years in the way of planning improved teaching of mechanics, not only in the Physics Department but throughout the Institute. Coupled with this information was a piece of advice: I should wait until Ned Frank returned from his year of study with Sommerfeld in Munich, and I would find he was the one to take charge of the new effort. I waited, and he was.

From that day to this, he has been a leader in the teaching of mechanics in particular, physics in general. One of his first major steps was to organize a special elementary course in physics for the undergraduates who were going on in physics or related subjects. His texts on mechanics and heat, electricity and optics, which grew out of this course have been an inspiration to students throughout the country who wanted a more thorough and scholarly introductory course in physics than the standard treatment. He also collaborated with me in setting up a more advanced course in theoretical physics, for seniors and graduate students, and the text which we wrote jointly for that course still, after 35 years, finds numerous users.

Since the war he has kept up the same interests. While he was department head he encouraged the interest in physics teaching not only at the Institute, but, through the Physical Sciences Study Committee, through the country at large. And now, with his ambitious program of development of occupational and vocational training on a wide scale throughout the country, he is starting work which is likely to have a great deal of importance in the years to come. It would be hard to find anyone who has had a longer and more beneficial effect on the teaching of physics in this country than N. H. Frank.

—John C. Slater
 Institute Professor, Emeritus



Hoyt C. Hottel, S.M.'24
Carbon P. Dubbs Professor of Chemical Engineering

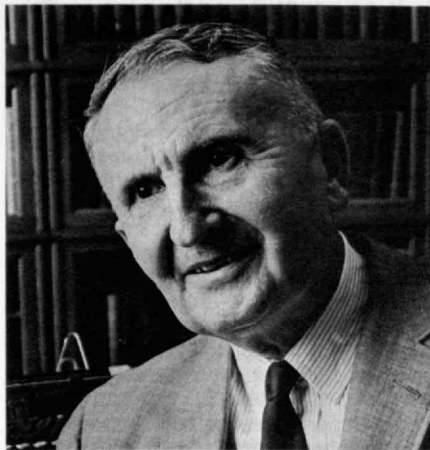
Hoyt Hottel is one of the hard core of great men who have made M.I.T. He has received notable awards from Britain and about all of those available to a chemical engineer in this country.

Professor Hottel's outstanding qualities are his intellectual integrity and his great curiosity about natural phenomena. In supervising the doctoral theses of 60 chemical engineers he has conveyed his standards and his enthusiasms to a highly successful group of alumni. Some 15 are professors, one is a Fellow of the Royal Society, and the rest are leaders in industrial research.

Professor Hottel is known internationally for his work in three fields: thermal radiation in furnace enclosures, the mechanism of combustion processes, and the collection of solar energy. His studies of thermal radiation put the design of large industrial furnaces on a sound scientific basis, and his recent book Radiative Transfer (with Adel Sarofim, Sc.D.'62) is a classic record of the contributions of a lifetime to the subject. He has played the major role in the Institute's program of research on solar energy utilization and once built a sun-heated house on the Institute's back lot with an underground hot water storage tank almost as big as the house. I suggested to him that he install a heat-operated refrigeration unit to cool the house in the summer: the hotter the sun the cooler the house—and the greater the publicity. Hoyt studied the plans of the refrigeration unit and concluded that there was no question but that the scheme would work; therefore he rejected it because nothing would be learned by doing it. Could there be a better example of the philosophy of scientific inquiry?

The stature of an institution is measured by the caliber of its people; Hottel is one of those who have made M.I.T. what it is.

—Thomas K. Sherwood, Sc.D.'29
 Lamont Du Pont Professor of Chemical Engineering

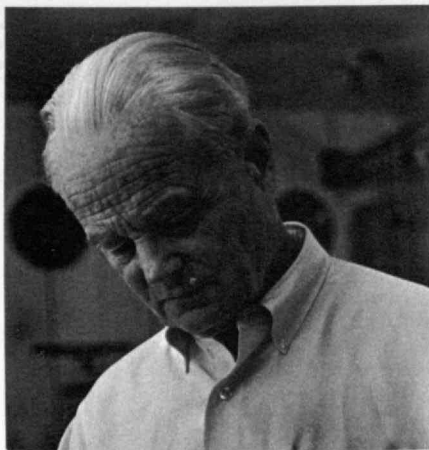


Egon Orowan
Professor of Mechanical Engineering

"Until several days ago we did not understand this subject, but yesterday when I was driving home. . . " are familiar opening remarks with which Professor Orowan has introduced many an important subject in his lectures on the physics of strength and plasticity. A master of the dramatic approach to create an air of urgency around his subject, Professor Orowan rarely disappoints his audience.

Although Professor Orowan's contributions to the understanding of the mechanical behavior of materials are many, he is best known for his introduction of dislocations into physics to explain the plastic deformation of crystals, and to many workers in the field of materials he is known as "Mr. Dislocation." With this penetrating interest in deformation processes from the atomic to the geologic scale, in materials from inanimate to animate, Professor Orowan was an "interdisciplinary" before the word became fashionable. Professor Orowan's method is to single out the central problems and elucidate the physical principles, leaving the mathematical facade to others. The theories of fracture and crystal plasticity are studded with short, neat, and powerful equations that no self-respecting worker can afford to ignore.

—Ali S. Argon, Sc.D.'56
Professor of Mechanical Engineering



Edward S. Taylor, '24
Professor of Flight Propulsion

Students and colleagues alike will hope that Eddie Taylor's retirement does not mean separation from M.I.T. During his career at M.I.T. he has been an extremely successful teacher both for undergraduate and the most advanced graduate students. In research he has been an inspired leader. To his colleagues his advice and counsel have been most valuable.

When first at M.I.T., starting in 1927, he was concerned with piston engines for aircraft. Very early he conceived a dynamic vibration damper for radial engines. Exploiting the principle that the period of a pendulum depends on the acceleration field in which it is placed, this "nervous counterweight" was a vital contribution to the continued development of large radial engines. With the introduction of the gas turbine engine Eddie's interests turned more and more to the new field. He has been the only Director of the Gas Turbine Laboratory, where he has inspired staff and students to do creative fundamental research into the problems of that engine which has resulted in a better understanding of the fundamental gas dynamics of the internal flow in the engine.

In Who's Who Eddie lists himself as "engineer"—certainly well deserved but too restrictive for such a broadly successful educator and applied scientist.

—Shatswell Ober, '16
Professor of Aeronautical Engineering,
Emeritus

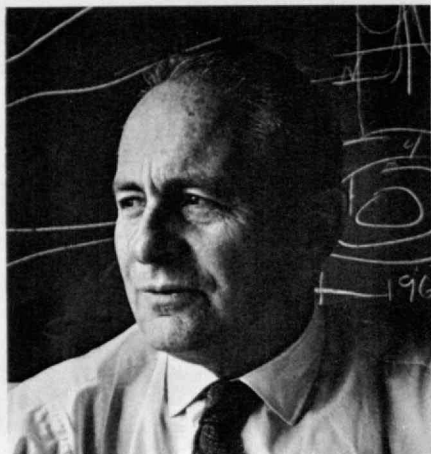


Walter F. Urbach
Associate Professor of Literature

With the retirement of Walter F. Urbach, M.I.T. loses a loyal, skillful, dedicated teacher. His entire professional life has been directed toward teaching, a task which for him was an all-important, exciting, and never-ending challenge. His intellectual interests were both wide-ranging and deep. His extensive reading, far outside the limits of his professional field of literature, gave unusual scope and perspective to his classroom discussions. His knowledge of mathematics and chemistry was a frequent source of surprise to his students; their reactions were no less often a source of amusement to him. His interest in young people extended beyond the classroom; they found in him an attentive, patient listener, a thoughtful, generous counselor.

Professor Urbach was not a "team man." He was highly self-reliant and much preferred to work independently. As a result many of his colleagues never came to know him well, but those who did, found a gracious, considerate friend and companion—a man of many ideas, strong convictions, and great integrity.

—Howard R. Bartlett
Professor of History, Emeritus



Hurd C. Willett
Professor of Meteorology

Occasionally an individual achieves the status of true distinction in a professional or scientific field by virtue of a single unique characteristic of intellect, personality, or character. More frequently, it is a combination of extraordinary attributes, and the relevance of these attributes to a particular interval of time in the development of the field of inquiry, that is the determinant.

So it has been with Hurd Willett. A significant segment of his career coincided with a period marked by profound changes in the field of meteorology—changes deeply rooted in scientific and technological advances and intimately related to the literally explosive expansion of formal instruction in meteorology and research in the atmospheric sciences in American universities and colleges. Through his influence on the thousands of students who took his courses, and the hundreds who came under his tutelage as graduate students doing thesis research, Hurd Willett played a prominent role in shaping the character of the field as it exists today.

His distinction depends on some remarkable attributes—intellectual integrity, an abiding and conspicuous faith that the nature of the physical processes in the atmosphere could be understood by creative, quantitative, sophisticated, and persistent analyses, almost incredible skill in the synthesis of the large array of weather maps that constitute the tools of the synoptic meteorologist, a righteous and towering wrath toward those practitioners of long-range predictions that lacked the firm foundation of scientific validation and rational sequence of cause and effect, clarity and succinctness in expression, a sensitive social conscience, and an appreciation that the celerity and creativity of the mind are related to the fitness of the body. May his scientific productivity and his zest for life continue undiminished in his "retirement"!

—Thomas F. Malone, Sc.D.'46
Vice President of the Travelers Insurance Company



John Wulff
Class of 1922 Professor of Metallurgy

In June, 1962, the Class of 1922 established an endowed faculty chair for the "purpose of rewarding and encouraging teaching at M.I.T.," specifically requesting "that the recipient devote not less than 50 per cent of his time in teaching and/or in preparation therefor." John Wulff, Professor of Metallurgy, was appointed as eminently qualified to meet this specification.

He has regularly taught students at all levels since joining the staff of M.I.T. in 1931. Undergraduates in all four years, graduate students and post-graduates have experienced the influence of his knowledge and are vocal in their tribute to his genius. Professor Wulff is best known to these generations of students as a dramatic lecturer who communicates an infectious belief in the vitality of materials science, in the value of experimental work and in the importance of the historical development of science and technology. He is an outstanding example of a diminishing breed—the great lecture-demonstrators.

—Parke D. Appel, '22, and Donald F. Carpenter, '22, President and Senior Vice President of the Class

Individuals Noteworthy

Philip G. Hill, Sc.D.'58, Associate Professor of Mechanical Engineering, has been appointed Head of the Department of Mechanical Engineering in the Faculty of Applied Science, Queen's University, Kingston, Ontario. The Reverend **Robert C. Holtzapfel, Jr.**, Religious Counselor at M.I.T., is one of 42 college ministers who has been awarded a Danforth Campus Ministry Grant for 1968-1969—an award allowing for a year of graduate study at a university or theological school of the winner's choosing. **Ithiel de Sola Pool**, Professor of Political Science and Head of the Department, has been appointed as a member-at-large of the Defense Science Board, U.S. Department of Defense. **Richard J. Wurtman**, Associate Professor of Endocrinology and Metabolism, has been chosen as the 1968 recipient of the John Jacob Abel Award in Pharmacology. The award, given annually for the purpose of stimulating fundamental research in pharmacology and experimental therapeutics by young investigators, recognizes Dr. Wurtman for "scientific excellence, unusual imagination and exceptional productivity."

E. Sherman Chase, '06, has been chosen to receive the Friendship Award of the Institution of Water Engineers (London) in recognition of his "outstanding efforts to promote goodwill and mutual understanding between American and Canadian water engineers and those in the United Kingdom." **James F. Crist, '24**, has been elected Chairman of Anderson Electric Corporation. **Howard A. Chinn, '27**, Director of General Engineering, C.B.S.-T.V. Engineering and Development Department, was selected as this year's recipient of the National Association of Broadcasters' Engineering Achievement Award.

Richard J. Hayes, '54, former Chief of N.A.S.A. Electronics Research Center's Space Guidance Laboratory, is now an Assistant Director of the Center. **Thomas E. Salisbury, '56**, was appointed President of the Firestone Synthetic Rubber and Latex Company. **Harold A. Schaub, '57**, was elected Senior Vice President of Campbell Soup Company, in charge of co-ordination and supervision of the company's frozen foods and Pepperidge Farm business in the U.S. **Richard R. Green, M.C.P.'59**, formerly Vice President of the Cambridge Corporation, a nonprofit civic development corporation, has been appointed Urban Renewal Director of the city of Cleveland, Ohio. Cleveland Mayor Carl Stokes, in announcing Mr. Green's appointment, said, "His academic qualifications are impeccable. He did an outstanding job in Boston."

Zeki Berk, Ph.D.'60, is now Head of the Department of Food and Biotechnology at the Israel Institute of Technology. **Guy W. Nichols, Jr., S.M.'61**, was elected Executive Vice President and a Director at New England Electric System.

Correspondence Review

Engineers and the Environment

To the Editor:

The May number of the *Review* is splendid, and it may well be the most important single number that the *Review* has ever published. This does not mean that I would, in fact, buy every idea in it, but at least it is recognition by the engineers that they have to take some account of what we are doing to the environment. A few weeks ago *Science* quoted a significant sentence from the report of the "Torrey Canyon" disaster by the Plymouth Laboratory: "We are progressively making a slum of nature and may eventually find that we are enjoying the benefit of science and industry under conditions which no civilized society should tolerate."

I think we have to be very careful, however, if we try to use the oceans as a sink for any of our wastes. The pollution of our harbors is a prime example of putting waste in more or less enclosed places; but we have another problem: if we put our wastes too deep in the ocean, they may do great damage before they can be diluted. A few years ago the oceanographer, Columbus Iselin, remarked that if we louse up the depths of the ocean we have loused them up for thousands of years. This is, of course, because the depths of the ocean are, of necessity, relatively oxygen-poor, and the circulation in it is extremely slow. You might get Iselin to write an article about this.

There has been some discussion pro and con about thermal pollution, and one point that does not seem to have been made is that if we take the case of an anadromous fish such as salmon, a stretch of warm water, even though it may not be warm enough to literally cook the fish, may prevent the passage of the fish. Such a stretch of water will work against the fish in two ways: the warmer water will have less oxygen in it and at the same time will increase the fish's demand for oxygen.

It may be that we have been developing modern civilization backward, that we should have considered—and perhaps

we still can within some limits—what kind of total environment we want to live under and then determine what parts of modern technology conduce to that situation and what an optimum sized population is and an optimum distribution of urban and rural living.

Charles H. Blake, '24
Hillsborough, N.C. 27278

To the Editor:

I generally found the articles on "Technology and Our Environment" (*Technology Review for May*) a valuable contribution to the debate on this critical issue. However, comments seem desirable on several of Mr. Brower's points.

It is ironic that Mr. Brower should appear in symposium to which the head of Resources for the Future also contributed. Mr. Brower has failed to recognize the issues about conservation that have been so effectively raised in R.F.F. studies and are repeated in Mr. Fisher's article. The Brower call for tithing is all too similar to historical cries for saving resources on the mistaken belief that supplies are inadequate. Barnett and Morse have shown the persistent tendency to underestimate the ability of technology to augment our resource base. They argue that imposed limits on resource use may deter technology and leave the future worse off.

They, Brower, and I recognize that the problem of environmental quality is not so easily solved. However, I feel that Brower's attack on growth and his support of wilderness to provide solitude go too far. To be sure, growth only for the sake of making the affluent richer materially is undesirable.

Every issue of *Technology Review* rightfully reminds us that many Americans are far from affluent. Economic growth surely eases the task of eliminating poverty. It is unlikely that a socially acceptable cure can be effected merely by redistributing existing incomes. As Mr. Fisher points out, the task of evaluating programs to control environmental pollution is quite difficult. While we cannot afford inaction, we also cannot ignore the hardships controls can create. For ex-

ample, the shift to low sulfur fuels is often advocated as an obviously desirable measure. The argument ignores the possibility that the controls will cause severe unemployment in the coal mines of Appalachia.

The trouble with preserving wilderness for solitude is that it obviously is a device to tax the poor to aid the rich. True wilderness exists only if no more than a small number of people can visit the area. Mass access spoils the region and national parks are high on conservationists' lists of undesirable uses of land. Thus, only a small elite of wilderness enthusiasts is to be allowed access to government designated wilderness areas. This elite surely will be richer on average than the excluded masses.

The taxpayer should not be asked to subsidize these people, but they should prove that their needs are more valuable by bidding the land away from other potential users.

This does not mean that preservation of wilderness by the government is undesirable but only that the argument has nothing to do with solitude. Quite the contrary, the value lies in the benefits to society of not using land for any purpose. Mr. Brower himself points out some of these benefits—the preservation of socially useful plants and animals. It is high time that he and other conservationists put their stress on these points instead of asking the public to pay to make his hiking more pleasant.

Richard L. Gordon, Ph.D. '60
Associate Professor of Mineral Economics
The Pennsylvania State University
University Park, Pa. 16802

To the Editor:

I write to congratulate you on the editorial content of your Vol. 70, No. 7, in which you deal effectively with matters of pollution and conservation of concern to this *Journal*.

At the same time I protest your use of straight sans serif type. A letter or a line of this type is beautiful. A whole magazine of it creates to me a featureless and horribly monotonous appearance.

I hope you may revert to the use of type permitting more artistic design.

Elliott Roberts, '21
Washington, D. C. 20016

The writer is Editor of Explorers Journal—Ed.

Gobbledygook?

To the Editor:

Have just read "New Patterns of Leadership for Tomorrow's Organizations" (see Technology Review, Apr., 1968, p. 37) by Warren G. Bennis, Ph.D.'55—an article "piled higher and deeper" with words, viz., "compartmentalization," etc.

He writes, "The university is a wondrous place for the development of advanced battle techniques between groups . . . becomes a loose collection of departments . . . largely non-communicating because of the multiplicity of *special jargons* (my emphasis) and interests . . ."

Hah. I wonder if he was ever the chairman of the board or the president of a highly competitive industry? If he is, or was, how could he get across his ideas, or follow the advice of his organization, or promote methods of procedure ("implementation"), or get across the "fomenting" of "innovation" by the use of such specialist jargon as that with which he writes?

I think he would only bore his listeners, if they did listen, and they would get back to work unconvinced of anything except gobbledygook.

Frank G. Smith, '11
Honolulu, Hawaii 96821

One of Our Own

To the Editor:

On p. 107 of the April Review—photo of Phillips—too bad "Deputy Administrator" wasn't identified as our own Robert C. Seamans, Jr., Sc.D.'42, currently a visiting professor here.

Walter McKay, '34
Department of Aeronautics and Astronautics, M.I.T.
Cambridge, Mass. 02139

Toward an Academic Institution

To the Editor:

I have been a member of the Alumni Association ever since I graduated in 1959. Since that time, I have seen on ballot after ballot both for officers of the Association as well as Term Members of the Corporation, a proliferation of business executives. It has been a rare day when an educator, a scientist or an engineer, a member of the civil service, an employee of a nonprofit organization, or any of a multitude of other industries or occupations have been represented among the nominees.

As you undoubtedly know, the nine nominees this year follow the mold of

past years. Every single one of them is a business executive. Even among the seven nominees for the National Nominating Committee, six are business executives and one is a professor of law.

I believe that these decisions on the part of the Alumni Association continue to encourage the Institute in many of the trends which have continued to detract from its contribution to an *academic* institution, which I remember President Stratton saying it was.

William G. Rothstein, '59
Baltimore, Md. 21210

Staggered Trusses (Cont.)

To the Editor:

We were pleased to read your report of our current research in the article entitled "Computerized Steel" (Technology Review for May, page 64) but were very disturbed by a statement referring to our previous project which said: ". . . competitive bidding on buildings planned to use the (staggered truss) system did not reveal the anticipated (cost) advantages."

Although it is true that a saving in steel tonnage is not always an index of actual savings in a structural system, precise estimates of the staggered truss system were provided to our staff by a steel fabricator who indicated substantial savings on a per square foot basis for space enclosed.

The November 9, 1967, *Engineering News Record* has reported a bid price for steel in place of \$352 a ton for a building using the staggered truss system in St. Paul, Minn. This same building was also reported on in the April, 1968, issue of *Architectural and Engineering News*, describing the 17-story, low-rent housing project for the elderly, as coming in some \$60,000 below original budget estimates.

It should be clearly understood that competitive bidding on buildings planned with the M.I.T. staggered truss system has revealed anticipated cost advantages.

Marvin E. Goody, M.Arch.'51
Robert J. Hansen, Sc.D.'48
Calvin F. Opitz, '65
Robert J. Pelletier, '51
M.I.T.
Cambridge, Mass. 02139

Liberals Guilty?

To the Editor:

May I congratulate the truly intelligent analysis of the disadvantaged black man discovering the truth as so admirably set forth by Ray C. Burrus, '22, in *Technology Review* for May, 1968.

Incidentally, the confirmation of his thesis found expression in the recent disturbance at Northwestern University wherein those apparently highly intelligent black students demanded their own exclusive residential facilities—and with nary

any fulmination whatsoever concerning such sound segregation!

And also, let's underscore the observations of A. Donald Green, '26, in the same issue about the concern of our intellectuals over the Vietnam War which were indeed succinctly outlined.

Such "liberals" apparently fail to recognize their guilt in fomenting the present revulsion of law and order under the guise of dissent that the communists certainly embrace and emphasize out of all due proportion. Too many professorial dilettantes prate about their academic freedom wherein they presumably confuse "freedom" with "license" for which latter privilege they absolutely deny any personal responsibility!

Perhaps for all our present travail, reason will ultimately prevail. A return to true conservatism should help to rectify the "mess" that our impractical liberals have wreaked upon our country. There are signs of such in the recent elections in England, thank goodness. After all, "liber" refers to freedom—and not exclusively to the rights of the left but to all of us!

Milton E. Parker, '23
Barrington Hills, Ill. 60010

Astonishing the Natives?

To the Editor:

I call your attention to two articles on engineering education—one in particular by Robert Hutchins, President of the Center for the Study of Democratic Institutions—in *Engineer* for March-April. You will note that he thinks that, in the interest of well-rounded education (and general betterment of the nation and world, one assumes), engineering schools as such should be "stamped out," and he specifically proscribes M.I.T., Georgia Tech and Caltech as major villains.

Reading, but, I fear, not fully following his article and the one by Samuel C. Florman, I get the general feeling that the ideal university student should be crammed with the "humanities" or "liberal arts," preferably to the exclusion of engineering, although a little "pure science" might be permissible.

I have been out of Tech nearly 55 years, hence am not by any means *au fait* with the present curricula (or should I say "disciplines"?), but I have the distinct impression that a great deal of emphasis is placed on humanities and liberal arts, not to say music, at M.I.T. nowadays. To an old timer like myself it almost seems too much at times. Therefore it seems to me that Hutchins and Florman are unfair to poor old M.I.T. even if their educational theories are unchallengeable.

For a young man today to become an ideal graduate or postgraduate of the Hutchins-Florman type of institution would seem to be an insuperable task,

but if successful he would undoubtedly become the cynosure and admiration of the "lay" world of ordinary humans who, like the Eighteenth Century peasants in Oliver Goldsmith's *Deserted Village* were awestricken by the erudition of their Schoolmaster:

"And still they gaz'd, and still the wonder grew
That one small head could carry all he knew."

Is the worthy Dr. Hutchins still trying, as he did in his earlier days, to "astonish the natives"? Or were his and the Florman articles "planted" to stimulate discussion, hence circulation for *Engleer*?

G. M. Rollason, '13
Plainfield, N.J. 07060

To Pay the Piper

To the Editor:

I want to congratulate Robert C. Cowen on both his subject and style in "Man's Fingerprints on His Environment" (see *Technology Review*, Apr., 1968, pp. 8-9).

Personally, I have a deep, growing, and long-standing concern with our entire ecological mess. I applaud the necessity and supreme relevance of articles such as his, but see all sorts of signs that we must increasingly pay the piper for what we have already done, not to mention for the continuation of the trends now in force. Our ecological ignorance and *hubris* I both fear and hope will appall those who come after us. Nor is it anything but inevitable that many of the more subtle and far-reaching implications of our present behavior will not be recognized for some time and that the imbalances involved will, consequently, continue for years.

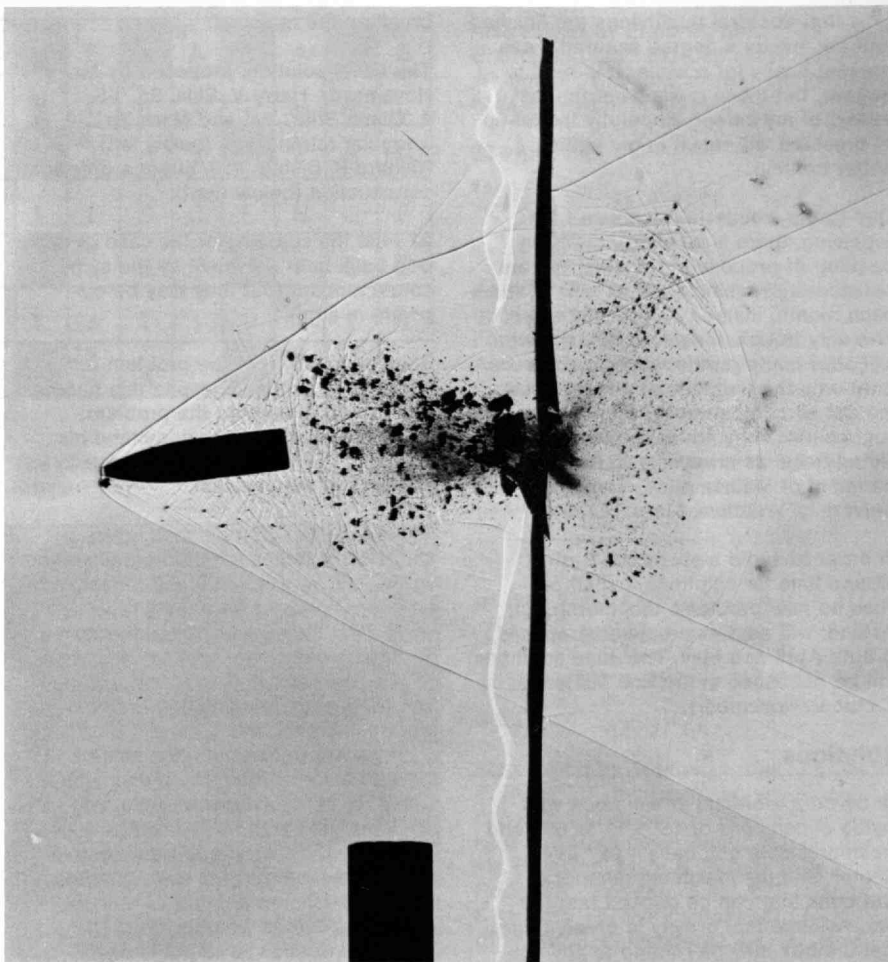
I have many times asked myself what kind of ecologic imbalance will bring our society to its senses. For whatever it is worth, it seems to me that articles such as Mr. Cowen's are absolutely essential and that they are beginning to penetrate to some extent. Nonetheless, since the public has not really generated much of a reaction to the most immediately pressing symptoms of ecological decay, such as air pollution, traffic jams, shortages of capital for school construction and the like, power failures, water shortages, and the destruction of the pleasantness of our surroundings, we may need far more acutely embarrassing imbalances.

Dr. William Haddon, Jr., '49
Washington, D.C. 20591

Dr. Haddon is Director of the National Highway Safety Bureau in the Department of Transportation. This letter was written on May 2 as a personal communication to Mr. Cowen and is published here with Dr. Haddon's permission.—Ed.

Strobe Probe

Harold E. Edgerton, Sc.D.'31



Mystery Photograph

This silhouette photograph shows a 30-caliber bullet (900 meters per second velocity) after it has impacted a Plexiglas bar.

1. The microphone (black box) is supposed to trigger the lamp when excited by the shock wave from the bullet. Obviously the flash has occurred before the bullet shock wave has reached the microphone. Why?

2. There is a white ghostlike exposure on the left-hand side of the Plexiglas. Why?

Answers are on p. 90.

Puzzle Review

Allan J. Gottlieb, '67

Now that doctoral qualifying exams are finished and my master's degree secured, I can breathe easily for a while. It is hard to believe, but those exams were the last exams of my career. Hopefully the let-up of pressure will result in my writing a better column.

Due to the wonderful response I am receiving, there is an ever-increasing backlog of proposed problems. We are considering running eight or nine of them each month, instead of this year's five. The only trouble is space. Perhaps we will offer many puzzles and for some print only the (numerical) answers, leaving out all computations. If you have any suggestions, why not send them in? My address, as always, is at the Department of Mathematics, Brandeis University, Waltham, Mass., 02154.

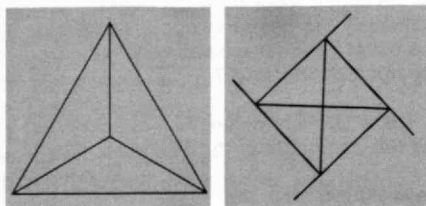
In order to avoid a six-month turnaround time for solutions, I shall propose no new problems this month but, instead, will answer problems proposed in both April and May. The June solutions will be published in the first fall issue (October/November).

Solutions

25 Given a rectangular solid box with inside dimensions of $18" \times 51" \times 69"$ and incompressible golf balls 1.82" in diameter, find the maximum number of golf balls that can be packed into the box. Assume that gravity is present and that the box may be rotated to any spatial orientation, so long as it is not deformed.

I am afraid we have no takers. Since some interest has been shown, a solution would be appreciated. (Eric E. Hovemeyer says at least 11,100 are needed.)

26 Given six matches of equal length, make four identical triangles without



breaking the matches.

The usual solution, proposed by Mr. Hovemeyer, Harry V. Ellis, 3d, '65, A. Glenn Stith, '64, and Mark Yu, '70, is a regular tetrahedron (below left); Richard P. Bishop, '59, offers a different construction (below right):

27 Find the solution for the case of two odd balls both defective by the same absolute amount (but they may be opposite in sign).

Somehow, only half the problem (as above) was printed. Despite this handicap Mr. Yu attempted the problem; unfortunately I cannot understand his solution, and indeed I cannot even understand the problem.

28 Using a two-pan balance, given a set of n weights, each of integral weight w_1, w_2, \dots, w_n such that any object with an integral weight from unity to $w_1 + w_2 + \dots + w_n$, the sum of all weights can be determined.

The most complete solution is from Martin J. Krone, '66:

(1) If we are to use only one side of the pan balance, then the binary weights 1, 2, 4, 8, 12, ... will work uniquely.

(2) If we know *a priori* that only integer weights will occur, there is no need to cover every integer; the even integers will do, for example. Thus 2, 4, 8, 16 ... will suffice as weights.

(3) If we are allowed to put known weights on both sides of the balance (subtract weights, in effect), then the problem is much more interesting. My reasoning is as follows:

a. We need only cover even weights.
b. The weights w_n should be chosen as follows: suppose we have N weights whose sum is S_N , and we are allowed to use both sides of the balance. Then w_{N+1} should be chosen so that

$$w_{N+1} - S_N = S_N + 2$$

$$w_{N+1} = 2 + 2S_N$$

assuming that the weights w_1, w_2, \dots, w_N are capable of balancing all even weights from 2 to their sum. (This formula is arrived at by requiring no re-

dundancy in the combinations.) The first few weights by this method are: $w_1 = 2, w_2 = 6, w_3 = 18, w_4 = 54$, and $w_5 = 162$. The following difference equation then results:

$$S_{N+1} = 2 + 3S_N.$$

The solution by standard methods is

$$S_N = 3^N - 1, \text{ and}$$

$$W_N = 2 \times 3^N.$$

Thus for solution (3) the determinable set of weights increases as 3^N ; this is in contrast to $2^N - 1$ and $2^{N+1} - 1$ for solutions (1) and (2), respectively. I believe that solution (3) is optimal (i.e., the determinable set S_N increases fastest with the number of weights N) but can't prove it, being a lowly engineer (sic).

Also solved by Mr. Bishop and Leon Sutton, '62.

29 With the following, South is the declarer at seven spades. West leads $\clubsuit 8$. The problem is to make seven against any defense.

\spadesuit K J 9 7 6	
\heartsuit A J 9 6 5	
\diamondsuit —	
\clubsuit A J 9	
\spadesuit Q 10 8	\spadesuit —
\heartsuit K	\heartsuit Q 10 8 7 4 3 2
\diamondsuit K 3 2	\diamondsuit Q 10 8 7 4
\clubsuit 8 7 6 5 4 3	\clubsuit K
\spadesuit A 5 4 3 2	
\heartsuit —	
\diamondsuit A J 9 6 5	
\clubsuit Q 10 2	

I like the following by F. Ted Leahy, '33: Win \clubsuit A, win with $\clubsuit 10$, play low \spadesuit , win with \spadesuit Q, and play low \spadesuit again, always winning as cheaply as possible in dummy. Play highest \spadesuit remaining in dummy, thus pulling West's last trump. During these six tricks, East has had a choice of about 100,000 ways ($12!/7!$) to discard, but it is only necessary to note that he now holds (a) fewer than four \diamondsuit 's or (b) fewer than four \heartsuit 's. If (a), overtake \spadesuit , ruff low \diamondsuit , ruff low \heartsuit , ruff low \diamondsuit , ruff low \heartsuit ; declarer's hand is all good. If (b), do not overtake \spadesuit , ruff low \heartsuit , ruff low \diamondsuit , ruff low \heartsuit , ruff low \diamondsuit ; dummy is good.

Acadco Corporation	39
Albert Pipe Safety Company, Inc.	35
Allegheny Ludlum Steel Corporation	72
Armstrong-Donner Industries	42
W. J. Barney Corporation	34
Bethlehem Steel Company	45
Blower Engineering Laboratories, Inc.	65
Capital Engineering Corporation	63
Cleveland, Varney and Pitts	62
Charles Nelson Deben Associates	50
Defendorf Gear Corporation	33
Paul E. Dunlap, Inc.	48
Edco, Friend & Jernigan	32
Eastman Kodak Company	2

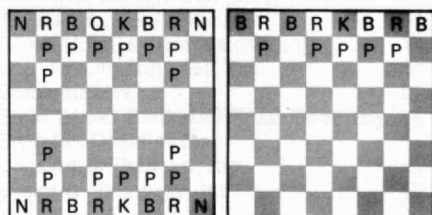
1	B		2	R		3	A		4	D		5	A		6	R		7	F		8	A		9	A		10	B						
11	A	C			12	M		A		D		13	S		U		B		O		14	P		T		I		M		15	A		L	
	B			16	P			W			17	A			M			18	R		E		A			19	E		S		U			
20	B		E		A		21	T			22	O		B		S		O		L		E		S		C		E		N		C		E
	A			23	T		H		24	E		R		E			R			25	S		E		T			26	T		O		E	
27	G		E		N		E		R		A		L		R		E		L		A		T		I		V		I		T		Y	
	E			28	A		N		G		L		E			D			29	W		A		C			30	A		S		E		

Also solved by Winslow H. Hartford, '30, and Allen L. Zaklad, '65.

30 Above is the author's solution to the crossword puzzle. Solutions were sent in by Avinash K. Dixit and Marion R. Hart, '13, who says it was "the first puzzle in *Technology Review* where I even understood the problem." And we're pleased to announce that a crossword or a double crosstick will be a regular monthly feature of the *Review* beginning in the fall.

31 Place some or all of the chess pieces belonging to one side on the board in such a way that none of them can legally move.

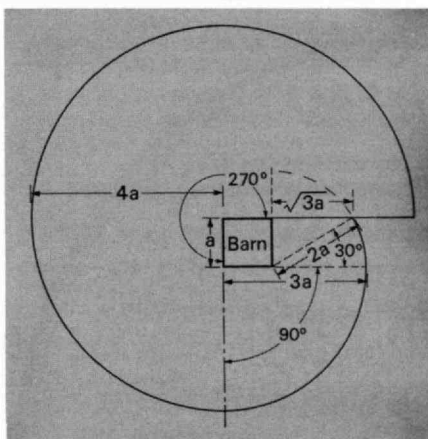
Here are three solutions from John L. Marshall, '67:



Also solved by Donald R. Oestreicher, '67, Thomas D. Landale, S.M. '54, George Farnell, '41, and Allan Gottlieb, '67.

32 A cow is tethered to the corner of a square barn in a level field. The length of the tether equals the perimeter of the barn. The cow can graze over just one acre. What is the size of the barn, "give or take" a small decimal fraction?

The neatest solution is from Arthur L. Kaplan, '54:



Referring to the sketch, the one-acre (43,560 sq. ft.) grazing area of the cow is defined by the expression $\frac{3}{4}[\pi(4a)^2] + \frac{1}{4}[\pi(3a)^2] + \frac{1}{12}[\pi(2a)^2] + \frac{1}{2}(\sqrt{3}a^2) = 4.3560 \times 10^4 \text{ ft.}^2$

where a is the length of one side of the square barn. Solving this expression for a yields $30.547 = 30' 6''$ as the outside length of one side of the square barn.

Kenneth B. Blake, '13, adds: I guess Frank G. Smith, '11, must have cut class the month you assigned problem 10. Problem 32 is the same, aside from the fact that 10 gave the size of the barn and asked for the area. Or does having the grazer a cow instead of a horse make a difference?

Also solved by Frank G. Smith, '11, John E. Prussing, '62, and Captain Roger A. Whitman, '61, whose answer came from "somewhere near Saigon."

33 Prove that

$$\sum_{n=1}^k n^2 = \frac{k(k+1)(2k+1)}{6}$$

Anthony D. Filardi, '46, says to use induction as follows:

For $k = 1$, the problem is trivial. Assume the equation true for $k = r$. In the case of $k = r + 1$:

$$\begin{aligned} \sum_{n=1}^{r+1} n^2 &= \sum_{n=1}^r n^2 + (r+1)^2 \\ &= \frac{r(r+1)(2r+1)}{6} + (r+1)^2 \\ &= (r+1)/6 [r(2r+1) + 6(r+1)] \\ &= (r+1)/6 (2r^2 + 7r + 6) \\ &= [(r+1)(r+2)(2r+3)]/6 \end{aligned}$$

Q.E.D.

Also solved by Thierry Labour, '72, John P. Rudy, '67 (the proposer, whose solution was hopelessly complicated and who obviously never heard of induction), Mr. Prussing, Mary A. Rogers (wife of Roddy R. Rogers, S.M. '57), Daniel S. Diamond, '65, Mary Lindenberg (wife of Martin S. Lindenberg, '39), Mr. Hove-meyer, and Captain Whitman.

34 Make 7 with two 2's. The proposer, Smith D. Turner, '26, offers

$$\sqrt{\log \sqrt{\text{antilog} [\text{antilog} (2)] - 2]}$$

I offer:

$$\sqrt{\log \sqrt{\text{antilog} [\text{antilog} (2)]} - \log \sqrt{\text{antilog} (2)}}$$

And Donald J. Cimilluca, S.M. '67, suggests: $d[(x \times x)/2 + x]/dx|_{x=2} = 7$.

Speed Department

SD11 For those who had trouble, a forfeit is recorded, 1-0.

Better Late Than Never

5 Mr. Hovemeyer has the following complaint about the problem numbered 5 in November:

I enjoy your column very much, but I do have one criticism: I feel that your attitude toward some of the problems as expressed in your column reflects what I feel is a typical engineer's view of mathematics. That is, I feel that your column suffers occasionally due to its not being precise as well as the fact that at times more concern is shown for displaying a solution than is shown for the method of solution. An example of what I am referring to is in problem 5 (November), which is to express the volume of a regular dodecahedron in terms of the length of an edge. The solution which you published was $V = 7.544 a^3$, which is, of course, not true and is not even as good as the approximation of $V = 7.66312 z^3$ given in the 14th edition of the CRC tables. If you are going to publish an approximation, why not at least use one which is close? Actually, I feel that neither of these solutions is satisfactory. Why not be precise? My solution to the problem is $V = 5/2 a^3 \tan^2(3\pi/10) \tan[\sin^{-1}[1/(2 \sin \pi/5)]]$.

By the way, I am not an engineer—but rather a Ph.D. candidate in theoretical mathematics. The opinions (and styles) expressed by the responders in no way reflect those of the editor.

5 (December) A solution has come from Bill Dunbar.

7 Glenn A. Stoops, '61, Box 6442, Carmel, Calif., 93921, has some partial results and a closed-form solution for one part. He adds:

I don't care if I don't see this in print, but I had to get it off my chest. I do greatly enjoy your column, so much that I turn to it even before the '61 notes.

10 The answer printed was wrong, and correct estimates have now been submitted by Mr. Smith, John W. Callon, and Mr. Prussing.

15 In elementary number theory, the rationals $[0, 1]$ have measure zero because if we order them like $(0, 1, 1/2,$

$1/3, 2/3, 1/4, 3/4, 1/5, 2/5, 3/5, 1/n, 2/n, \dots (n-1)/n, 1/(n+1), \dots)$ we can cover them with open intervals of length $e, (1/2)e, \dots (1/2^n)e$, so measure of cover is $\leq 2e$. The problem is: Suppose $e = 1/10$; then the covering has length $\leq 1/5$. Exhibit a real number in $[0, 1]$ which is not covered.

I am happy to say that John A. T. Munzer, '66, has earned a free subscription to *Tech Engineering News* for this first solution:

$A = [(-1/20, 1/20) \cup (39/40, 41/40)] \cup$

$$\bigcup_{n=2}^{\infty} \bigcup_{k=1}^{n-1} (k/n - \epsilon_{n,k}, k/n + \epsilon_{n,k})$$

where $\epsilon_{n,k} = 2^{1-k}\epsilon_{n,1}$

$$\left. \begin{aligned} \epsilon_{2,1} &= 1/10 \cdot 2^{-3} \\ \epsilon_{3,1} &= 1/10 \cdot 2^{-4} \\ \epsilon_{4,1} &= 1/10 \cdot 2^{-6} \end{aligned} \right\} \epsilon_{n,1} = 1/10 \cdot 2^{-\frac{n^2-3n+8}{2}}$$

To demonstrate that $1/e \notin A$:
Suppose $|1/e - p/q| < \epsilon_{q,p}$ for $q \geq 2$

then $|1/e - p/q| < \epsilon_{q,p} \leq \epsilon_{q,1} = 1/10 \cdot$

$$2^{-(q^2-3q+8)/2} = 1/10 \cdot 2^{-[(q-3/2)^2]/2}$$

$$\cdot 2^{-23/8} < 1/40 \cdot 2^{-[(q-3/2)^2]/2}$$

But $|1/e - p/q| = |1/e - [(q-1)!]$

$$p/q| \geq |1/e - (1/2! -$$

$$1/3! + \dots \pm 1/p!)| = 1/[(q+1)!]$$

$$- 1/[(q+2)!] + \dots =$$

$$X > 1/[2(q+1)!]$$

*This inequality is true because

$$X < 1/[(q+1)!] < 1/(2q!)$$

This supposition has now led to:

$$1/[2(q+1)!] < 1/40 \cdot 2^{-[(q-3/2)^2]/2}$$

$$\text{Let } f(q) = 20 \cdot 2^{-[(q-3/2)^2]/2} / (q+1)!$$

and show $f(q) \geq 1$ for $q \geq 2$:

$$[f(q+1)]/f(q) = \{(q+1)! \cdot$$

$$2^{[(q-1/2)^2]/2} \} / \{(q+2)! \cdot 2^{[(q-3/2)^2]/2} \}$$

$$= 2^{1/2 [(q-1/2)^2 - (q-3/2)^2]} / (q+2) =$$

$$2^{(q-1)/(q+2)}$$

$$[f(q+1)]/f(q) < 1 \text{ for } q = 2, 3$$

$$[f(q+1)]/f(q) > 1 \text{ for } q = 4$$

So $f(q)$ has a minimum at $q = 4$.

$$f(4) = (20 \cdot 2^{25/8})/120 > 1.$$

Note: $1/3 \notin (-1/20, 1/20) \cup (39/40, 41/40)$.

Other solutions have been received as indicated:

16 Eric Rosenthal (son of Meyer S. Rosenthal, '47).

17 John L. Joseph, '40.

20 E. W. Radtke and Mr. Yu.

24 Rolfe Petschek and Mr. Yu.

Allan J. Gottlieb, '67, is a graduate student in mathematics at Brandeis University. Address correspondence to him at the Department of Mathematics, Brandeis University, Waltham, Mass., 02154.

"Strobe Probe" Answers

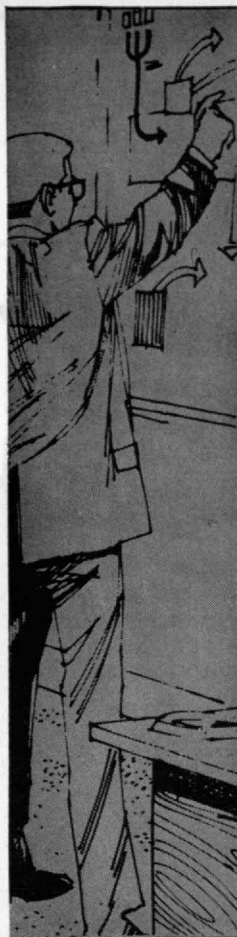
1. The bullet shock wave has not reached the microphone; but a much weaker shock wave (barely visible in the picture) from the bullet's impact on the Plexiglas has triggered the microphone.

2. The ghostlike exposure beside the Plexiglas is reflection of light from the Plexiglas surface.

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Alumni Review



Kane on M.I.T.

An Alumni Day Sketchbook



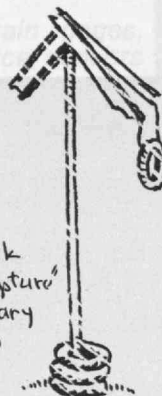
The rhododendrons were beautiful — but then came the rains and all activities moved indoors



Al. Association Pres. Greg Smith '30 at lunch: "Our Association is on the threshold of a greater bond with MIT"



Junk "Sculpture" on library lawn



I see L. David Sloane's coming



Pres. Howard Johnson: "Our grass is getting greener, our buildings more intriguing, our art, 2."



Prof. Sanford Miller in 10-250



"Malnutrition in childhood definitely affects later ability to learn."



B.M.O.C. Big Men on Committee (Total: 24'*)

OUTSIDE TELEPHONES

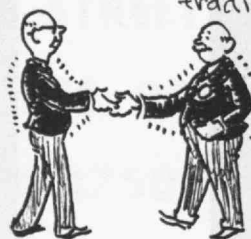


Calling the office — or stock broker? or hookie?



'43's nautical headgear evidently came only in kiddie's sizes!

After 3 years, those bright red blazers sported by the 50-year class must certainly be considered traditional.



Even after three days of reunion revelry, the Gray Berets of '28 were still able to take one more cocktail party.



H.D. Kane

Alumni Review

Reunions: Bright and Warm

New England's mood was at its best when at least 1300 M.I.T. alumni returned to meet friends and classmates at 12 reunions from Cambridge to Provincetown on June 7, 8, and 9. A "back door" cold front, for which Massachusetts is famous in June, arrived only late on Sunday—in time to cool traffic-born tempers and put into effect the "foul weather" plans for Alumni Day. But the weekend was bright and warm.

Programmed highlights of the reunions included an evening address by Julius A. Stratton, '23, President Emeritus of M.I.T. who is now Chairman of the Ford Foundation, to his classmates at dinner on Saturday at Bass River on Cape Cod; a morning program for the Class of 1928 on the campus on Saturday with Secor D. Browne, Associate Professor of Aeronautics and Astronautics, and Dr. Joseph B. Brenner, Psychiatrist in the M.I.T. Medical Department; and a discussion of new educational programs and plans by Walter A. Rosenblith, Chairman of the Faculty, for the 25-year Class of 1943 in Kresge Auditorium on the campus Saturday afternoon.

But the informalities were more important than the formalities for most visitors. Those on the campus were guests at receptions at the home of President and Mrs. Howard W. Johnson, elegant dinners in the new Student Center, and outings to favorite New England spots—to Anthony's Pier 4 Restaurant for the Class of 1928, to the Crane estate on Castle Hill in Ipswich for the Class of 1943. For those on the Cape, the informalities were simpler and more obvious—but none the less enjoyed.

There were special privileges for those on the campus—a computer console in Baker House programmed to provide some useful practical experience in conversation with computers, tours to familiar and unfamiliar landmarks, tennis courts, swimming pool, and sailing dinghies, and some horseplay involving William W. Laird, Jr., '43, who looks so much like M.I.T.'s President Johnson that he was able to confuse most of his classmates completely.

Class of 1923: Nothing Routine or Repetitive

A lesson on how to retire gracefully—without retiring—was brought to the reunion of his classmates on June 8 by Julius A. Stratton, '23, President Emeritus of M.I.T. who is now Chairman of the Ford Foundation. At the 45th Reunion of the Class at Bass River, Cape Cod, Dr. Stratton described to his classmates his "good fortune to have graduated from one positive, active institution to another."

Because the Ford Foundation has unequalled resources and intends to be an agent of innovation and change, he said, "nothing is routine or merely repetitive."

Describing the work and challenges of the Foundation and its current program interests, Dr. Stratton noted that in the international field, the Foundation now is concentrating especially on helping to increase the numbers and ability of professional, managerial, and governmental leaders in the developing countries, and helping the institutions which produce and support these leaders and their ideas. "What makes a country change and

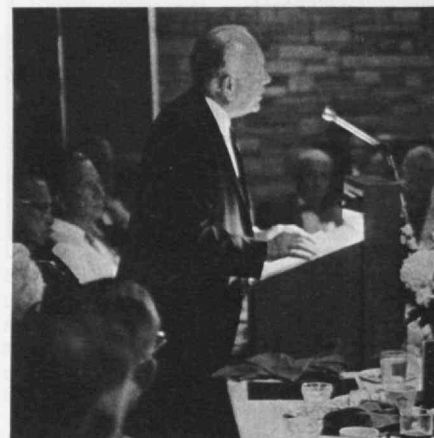
develop," he told members of the Reunion, "is the competence of such leaders to understand the problems they confront, to plan and execute programs for change, to persuade and inspire people to support those problems—in brief, to show them how to help themselves."

Another major program objective, he said, is to contribute to the solution of urgent national problems—the problems of the city and its poor and disadvantaged, and especially, he said, "the problem of learning how each of us, individually and as corporations or instruments of local government, can contribute to the restoration of confidence, of strength, and of stability to our kind of democratic society."

And above all, Dr. Stratton declared, is the role of the private foundation in assuring diversity for America—"of assuring that there remains open a multiplicity of paths to the achievement of our national goals—many institutions, public and private, standing against the peril of a massive central concentration of bureaucratic power which is the mark of the totalitarian state."



Reminiscences: Mrs. Karl T. Compton, wife of the Institute's ninth President, told the Class of 1954 Reunion Luncheon that she is "more gratified than I can say to have remained close to Tech . . . M.I.T. has always been more than most relevant to the day, and so it is now." And Julius A. Stratton, '23, President Emeritus, speaking to his classmates at Bass River on June 8 said he has had "the good fortune to have graduated from one positive, active



institution to another," referring to his post as Chairman of the Ford Foundation.

Memorable moments in a memorable weekend for the Class of 1943: A gala reception and dinner at the M.I.T. Student Center featuring Professors Roy Lamson and Warran Rohsenow in the Ringer-Gilford Currier; Professor Walter A. Rosenblith on the "new" M.I.T.; the fun of William W. Laird, Jr., '43, when he found he could pass for M.I.T.'s President Howard W. Johnson; campus tours to show how times have changed; and the inevitable class picture on Kresge Auditorium steps.



Class of 1943: What It Looks Like "n" Years Later

"Education is the overture to a continuously changing play," Walter A. Rosenblith, Professor of Communications Biophysics and Chairman of the M.I.T. Faculty, told the Class of 1943 at a special lecture during its 25th Reunion on June 8; and if an educational institution is to be relevant to the lives and aspirations of its students, it, too, must change, he said.

Professor Rosenblith used three examples to demonstrate how the Institute

has changed in 25 years and will continue to change in the future—the increasing number, now up to 80 per cent, of the undergraduates who go on to graduate school, plans for a pass-fail grading system for first-year students which the faculty hopes will "open up the freshman year to experiment in a way heretofore almost impossible," and the development of a new task force to restudy such basic questions as what kind of an education M.I.T. should be providing for its students, including new programs of research on the educational processes which should be involved.

"We have as yet done far too little to use our special knowledge of science to benefit the educational process," Professor Rosenblith admitted to his audience, and we know too little about "what it means to be a man who can act because of what he can control through his knowledge of science and technology."

One aspect of this new posture of self-criticism, said Professor Rosenblith, should be alumni "input" to M.I.T.'s discussions of educational policy. We need, he said, "valid feedback on what it looks like 'n' years later."

Alumni Association: New Alumni Officers and Trustees

Cecil H. Green, '23, Honorary Chairman of Geophysical Services, Inc., and a director of Texas Instruments, Inc., both of Dallas, Texas, was announced as new President of the 55,000-member Alumni Association of the Massachusetts Institute of Technology during the Alumni Day Luncheon on June 10.

Mr. Green, elected in a national balloting during the spring, takes office as President on July 1 succeeding Gregory Smith, '30, President and General Manager of the Eastman Gelatine Corporation, Peabody, Mass.

In the nationwide balloting, Mr. Smith along with two other prominent alumni—William D. Hartmann, '37, a partner in the architectural firm of Skidmore, Owings and Merrill, Chicago, Ill., and Henry E. Singleton, '40, Chairman of the Board of Teledyne, Inc., Hawthorne, Calif.—were elected to five-year terms on the M.I.T. Corporation. Breene M. Kerr, '51, Director of Kerr-McGee Corporation and Vice President of Kerr-McGee Chemical Corporation of Oklahoma City, Okla., and Carl L. Mueller, '41, partner and member of the Management Committee of Loeb, Rhoades and Company, New York investment banking firm, were elected Vice Presidents.

Chosen for the Association's Executive Committee were: A. Rufus Applegarth, Jr., '35, President of Aradar Corporation, Plymouth Meeting, Pa.; Angus N. MacDonald, '46, partner in Braxton and Company, New York, Chairman of the M.I.T. Alumni Center of New York; and Kemon P. Taschioglou, Manager of Marketing Services, Teredyne Corporation, Boston, Mass.

Mr. Green, the new Association President, has been a member of the M.I.T. Corporation since 1958 and a Life Member since 1961; he and Mrs. Green are the donors of the M.I.T. building housing the Center for Earth Sciences. Mr. Green is a geophysicist and electrical engineer who helped pioneer the application of seismographic techniques to the search for oil.

Gas Turbine Laboratory: Theories on Theories and Answers

Edward S. Taylor, Professor of Flight Propulsion who is a world authority on jet engines, retires this summer after 42 years of teaching at M.I.T. To pay tribute, more than 100 of his former students came to a sentimental "meeting in miniature" at the Institute on June 8; they used three scientific papers on gas turbine aerodynamics, two-dimensional flow, and engineering design as a format for a light-hearted repartee and reminiscence on the personalities and achievements of the M.I.T. Gas Turbine Laboratory which has been Professor Taylor's responsibility since its founding in 1946.

A very special gathering of former students and other friends paid tribute to Edward S. Taylor, '24, Professor of Flight Propulsion, at a symposium in his honor on June 8. The scientific contributions at the "meeting in miniature" were not insignificant, but many of the more than 100 who came found the corridor informalities equally memorable.



In the course of the afternoon, two of Professor Taylor's personal theories were elucidated: the theory on theories—that in developing any theory, we only perfect it to the point where all the mistakes cancel, and the theory on answers—that if the answer is simple it is probably right, but otherwise it is probably wrong.

C. Stark Draper, '26, Director of the M.I.T. Instrumentation Laboratory who spoke on engineering design at the symposium, said that Professor Taylor "was the guiding genius of the most pleasant years I ever spent." To generalize from the other speakers' more technical presentations, Professor Draper said that the "Taylor method" was first to gain knowledge and then to gain from it understanding; Professor Taylor's contribution was to emphasize the very great lack of quantitative information in the field, to insist upon "the importance of imagination carried to the point of a specific goal."

Other speakers on the afternoon program were William R. Hawthorne, Sc.D.'39, Professor of Engineering at Cambridge University, England, and John D. Stanitz, '42, a research consultant in the field of fluid dynamics; Robert C. Dean, Jr., '48, President of Creare, Inc., read a tribute to Professor Taylor, and "Eddie's Years at M.I.T." was Professor C. Fayette Taylor's ('29) subject in an after-dinner speech, following a reception at the conclusion of the symposium. The symposium tribute was arranged by James

R. Turner, '50, Vice President of Dynatech Corporation.

Lehigh Valley: Cleansing by Sound

Dr. Emmanuel P. Papadakis, '56, Staff Physicist at the Bell Telephone Laboratories in Allentown, Pa., was the featured speaker at the annual dinner meeting of the M.I.T. Club of the Lehigh Valley on June 5. Dr. Papadakis, who has just received the Biennial Award of the Acoustical Society of America, spoke about "Vibrations Heard, Felt, and Seen." Members and their wives enjoyed having their finger-rings cleansed by means of ultrasonic sound waves.

The Club's first President, Edmund J. Flynn, '19, is again a Lehigh Valley resident and was present at the meeting. The newly elected officers include: Dexter A. Olsson, '57, Secretary; Joseph B. Scheller, '54, Treasurer; and Members-at-large Michael V. Herasimchuk, '39, and Walton W. Hofmann, '34. Mike Herasimchuk and Ed Flynn were jointly responsible for the formation of the Club in 1947.

A picnic for members and area M.I.T. students and their families has been planned for the late summer. Efforts are now being made to align the Club's program more closely with the work of the M.I.T. Educational Council and to attract more and younger alumni to upcoming Club activities.—Dexter A. Olsson, '57



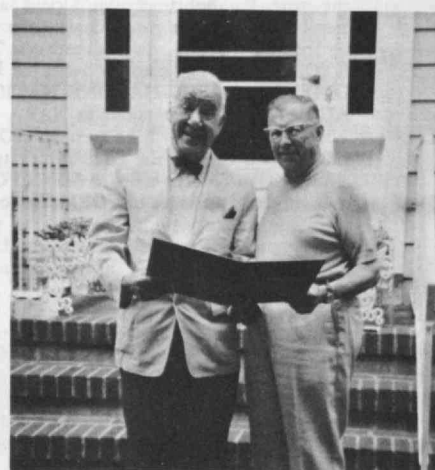
Among the M.I.T. reunions, June 8-10 (top to bottom, left to right, this page, then opposite): The Class of 1918 at the Wianno Club in Osterville and, upon registering on June 6, in the McCormick Hall court; the Class of 1948 en route to Martha's Vineyard; the Class of 1913 at Coonamessett Inn in Falmouth; a Japanese "linear clock" added to M.I.T. President Howard W. Johnson's collection by Mrs. Arthur A. Nichols for the Class of 1928; members of the Class of 1948 select their identification at the Harbor View Hotel in Edgartown; the

ALUMNI
GRADUATES—1928-1969

WILLIS: the most and largest town of
QUED PETHO (as visited by Hamilton
that the entire town is protected by law as
a national monument), the building complex
of the architecture of BRASLIA; and
KANAMA CITY with the famous Canal
Suez Canal and the famous shopping



Graduate Alumni Association of the Sloan School of Management at the Student Center; Professor Harold E. Edgerton, Sc.D., '31, entertaining the Class of 1928 with his ready wit and brilliant photography; the President's Reception for the Class of 1918; chairmen of Long-Range Planning Committees honored at the Alumni Day Luncheon; the Class of 1933 putting tourney at the Chatham Bars Inn; Professor John Wulff receives a special tribute from the Class of 1922 upon his retirement from the Department of Metallurgy.



SPECIAL REDUCED RATES FOR M.I.T. ALUMNI

FOURTH AND FIFTH ANNUAL TOUR PROGRAMS—1968-1969

This unique program of tours is offered to alumni of Harvard, Yale, Princeton and M.I.T. and their families. The tours are based on special reduced air fares which offer savings of hundreds of dollars on air travel. The tour to India, for example, is based on a special fare, available only to groups and only in conjunction with a tour, which is almost \$400 less than the regular air fare. Special rates have also been obtained from hotels and sightseeing companies. Air travel is on regularly scheduled jet flights of major airlines.

The tour program covers four areas where those who might otherwise prefer to travel independently will find it advantageous to travel with a group. The itineraries have been carefully constructed to combine the freedom of individual travel with the convenience and saving of group travel. There is an avoidance of regimentation and an emphasis on leisure time, while a comprehensive program of sightseeing ensures a visit to all major points of interest. Hotel reservations are made as much as a year and a half in advance to ensure the finest in accommodations.

THE ORIENT 30 DAYS \$1549

Sept. 21, 1968
Mar. 22, Jun. 28, Jul. 26,
Sept. 20, 1969

1969 will mark the fifth consecutive year of operation for this fine tour, which offers the true highlights of the Orient at a sensible and realistic pace. Eleven days will be spent in JAPAN, divided between TOKYO, the ancient "classical" city of KYOTO, and the FUJI-HAKONE NATIONAL PARK, with excursions to NARA and NIKKO. Five days will be spent in HONG KONG and four in the fascinating city of BANGKOK. Shorter visits to SINGAPORE and the lovely island of FORMOSA complete the itinerary. Optional pre and post tour stops may be made in HONOLULU and the WEST COAST at no additional air fare.

A complete program of sightseeing will include all major points of scenic, cultural and historic interest. Features range from a tour of the canals and floating markets of Bangkok, an authentic Javanese "Rijsttafel" in Singapore, and a launch tour of Hong Kong harbor at sunset, to a "Mongolian Barbecue" in Taipei, and a trip on the ultra-modern 125 m.p.h. express trains of Japan.

Tour dates have been chosen to coincide with outstanding seasonal attractions in Japan, such as the spring cherry blossoms, the beautiful autumn leaves, and some of the greatest annual festivals in the Far East. Total cost is \$1549 from California, \$1719 from Chicago, \$1787 from New York.*

INDIA

Including NEPAL and PERSIA
29 DAYS \$1549

Aug. 3, Oct 5, Oct. 12, 1968
Mar. 15, Mar. 22, Aug. 2,
Oct. 4, 1969

An unusual opportunity to see the diverse and fascinating subcontinent of India, to-



gether with the once-forbidden kingdom of Nepal and the rarely-seen splendors of ancient Persia. Here is India from the mighty Himalayas to the palm-fringed Bay of Bengal: the great seaport of BOMBAY; the magnificent cave temples of AJANTA and ELLORA, whose thousand year old frescoes are among the outstanding achievements of Indian art; MADRAS, in the south; the great industrial city of CALCUTTA; a thrilling flight into the Himalayas to KATHMANDU, capital of NEPAL, where ancient palaces and temples abound in a land still relatively untouched by modern civilization; the holy city of BENARES on the sacred River Ganges; AGRA, with not only the Taj Mahal but many other celebrated monuments of the Moghul period such as the Agra Fort and the fabulous deserted city of Fatehpur Sikri; the walled "pink city" of JAIPUR with an elephant ride at nearby Amber Fort; the unique "lake city" of UDAIPUR, with its delicate white marble palaces; the great capital of NEW DELHI; and the fabled beauty of the VALE OF KASHMIR, surrounded by the snow-clad Himalayas. PERSIA (Iran) includes visits to PERSEPOLIS, the great royal capital of Darius and Xerxes in the 5th century B.C.; and ISHFAHAN, the fabled city of the 15th-17th century Persian Renaissance, with its palaces, gardens, bazaar, and famous tiled mosques. Outstanding accommodations include hotels that once were palaces of Maharajas and luxurious houseboats on Dal Lake in Kashmir. Total cost is \$1549 from New York (\$1599 in 1969).*

SOUTH AMERICA 31 DAYS \$1599

Jan. 18, Jul. 26, Oct. 18, 1969

An original itinerary which takes unusually full advantage of South America's great scenic and cultural attractions. The trip descends along the West Coast, dominated by the towering Andes and filled with the churches and mansions of 16th and 17th century Spain, and returns through the modern cities and lush scenery of the East Coast. Stops include Spanish colonial QUITO, with the nearby Indian market at AMBATO and a drive along the snow-capped peaks of "VOLCANO ALLEY"; Pizarro's great viceregal capital of LIMA; the ancient city of CUZCO and the fabulous "lost city" of MACHU PICCHU; lovely SANTIAGO in Chile; cosmopolitan BUENOS AIRES, the continent's largest city; BARILOCHE, in the beautiful ARGENTINE LAKE DISTRICT; spectacular IGUAZU FALLS (largest in the world); the sun-drenched beaches of RIO DE JANEIRO (considered by many the most beautiful city in the

world); the quaint and historic town of OURO PRETO (so revered by Brazilians that the entire town is preserved by law as a national museum); the striking contemporary architecture of BRASILIA; and PANAMA CITY with the Panama Canal, Spanish ruins, and free-port shopping. These great points of interest are complemented by an assemblage of South America's truly outstanding hotels. Total cost is \$1599 from New York.*

EAST AFRICA 22 DAYS \$1549

Jan. 26, Jul. 13, Jul. 27, 1969

A luxury "safari" to the great national parks and game reserves of Uganda, Kenya and Tanzania. These offer a unique combination of magnificent wildlife and breathtaking natural scenery: great herds of elephant in QUEEN ELIZABETH PARK, in the shadow of the fabled "Mountains of the Moon"; a launch trip on the White Nile through hippo and crocodile to the base of the thundering MURCHISON FALLS; multitudes of lion and other plains game in the famous SERENGETI PLAINS and the MASAI-MARA RESERVE; the spectacular concentration of animal life in the NGORONGORO CRATER; tree-climbing lions around the shores of LAKE MANYARA; and the AMBOSELI RESERVE, where all types of big game can be photographed against the towering backdrop of snow-clad Mt. Kilimanjaro. Air travel is used where possible, enabling longer stays within the parks. Also seen are the fascinating capital cities of KAMPALA, NAIROBI and DAR ES SALAAM, the exotic "spice island" of ZANZIBAR, and the historic MOMBASA, a beach resort on the Indian Ocean, with its colorful Arab quarter and great 16th century Portuguese fort. Tour dates have been chosen for dry seasons, when game viewing is at its best. The altitude of most areas provides an unusually stimulating climate, with bright days and crisp evenings (frequently around a campfire). Accommodations range from luxury hotels in modern cities to surprisingly comfortable lodges in the national parks (some equipped even with swimming pools). Total cost from New York is \$1549.*

***Special rates from other cities on all tours. Tour cost includes Jet Air, Deluxe Hotels, Meals, Sightseeing, Transfers, Tips and Taxes.**

For ALUMNI FLIGHTS ABROAD
Full P.O. Box 99
Details Lenox Hill Station
Contact: New York, N.Y. 10021

Please specify tour and year in which you are interested.

Rhode Island: Former President Honored

Donald G. Robbins, '07, former President of the Alumni Association of M.I.T., was honored by the M.I.T. Club of Rhode Island on Wednesday, May 15. More than 70 alumni and wives, several past presidents of the M.I.T. Alumni Association and the "Keystones," an undergraduate singing club, were in attendance. Gregory Smith, '30, President of the Alumni Association, made a special presentation to Mr. Robbins.

Mr. Robbins is a retired Director of International Braid Company. He served as President of the M.I.T. Alumni Association in 1936 and was a member of the M.I.T. Corporation for eight years. He has also served as Secretary and President of the M.I.T. Club of Rhode Island and as Class Agent and later President of the Class of 1907. Peter L. Quattrochi, '44, President of the M.I.T. Club of Rhode Island, presided at the meeting. Program arrangements were made by S. Martin Billett, '48, Alexander D. Daunis, '32, and George E. Colby, '32.

Alumni Calendar

Cambridge—Alumni Officers' Conference on September 6-7, 1968.

Cambridge—Alumni Seminar, a three-day educational enrichment program for alumni, wives and faculty, tentatively set for November 9-11, 1968.

Club picnics to introduce entering freshmen to undergraduates and alumni will be announced locally in several cities.

1968 National Officers' Conference "A New and Different M.I.T."

All officers of alumni classes and clubs, Educational Counselors, and other alumni with official assignments in behalf of M.I.T. will be guests of the Alumni Association at the 1968 Alumni Officers' Conference in Cambridge on September 6 and 7, 1968. Ralph H. Davis, '31, chairman of the committee planning the two-day program, says its purpose will

be to deliver "the message that a new and different M.I.T. exists today."

Sessions will begin on Friday morning, September 6, with on-campus accommodations available for the previous evening; and the conference will conclude with a special luncheon on Saturday. Further information will be mailed with invitations by mid-summer, according to Mr. Davis.

Western Maine: Winds, Waves, and Sailing Yachts

The spring meeting of the Western Maine Club was held on May 16 in Portland. John N. Newman, '56, Professor of Naval Architecture at M.I.T., was guest speaker. Professor Newman described the research being done at the Institute on sailing yacht design by towing tank, wind tunnel and computers; and he showed slides of the 1967 America's Cup Races in which the U.S. *Intrepid* outclassed its Australian competitor.

Alumni members and guests attending the meeting were: John Babcock, '10, Secretary-Treasurer; Hall Baker and Mrs. Baker ('22); Peter Bishop, '54; Art Dickson and Mrs. Dickson ('17);

Howard Dole, '09; Bob Follansbee and Mrs. Follansbee ('32); George Gilfoil, Jr., and Mrs. Gilfoil ('62); Charles Hobson, '11; Bob Lindquist, President, and Mrs. Lindquist ('51); Phil Lord, '42; Fred Lufkin, '10; Lloyd MacAdam, '27; John Magarian, '52; John Ness and Mrs. Ness ('31); Charles Peirce and Mrs. Peirce ('32); Ed Rossman and Mrs. Rossman ('18); Earle Sanborn, '23; Malcolm Seymour and Mrs. Seymour ('36); Tom Shepherd and Mrs. Shepherd ('22); Edgar Ward and Mrs. Ward ('25); Harry Wong, who will enter M.I.T. next fall; and John Hennings and Mrs. Hennings.—John B. Babcock, '10.

South Florida: "On Its Way"

Thirty-four members, wives and guests attended the spring meeting of the M.I.T. Club of South Florida on May 16 at the DuPont Plaza Hotel in Miami.

Harry C. Le Vine, '18, described his recent assignment as an emissary to Managua, Nicaragua for the International Executive Service Corps. The Club is now "on its way." Mr. Le Vine believes, with arrangements being completed for a general election to select officers and board members for 1969.



At the first meeting of the New York Area Alumni Fund Council on April 25 at The Union League in New York City (left to right): James A. Stern, '42, Howard L. Richardson, '31 (Chairman of the Alumni Fund Board), Paul V. Keyser, Jr., '29 (Chairman of the Council), Franklin E. Penn, '40, James P. Eder, '34, Robert P. Fried, '46, Adrian G. Marcuse, '42, Ralph

Landau, '41, Arthur C. Silverman, '60, Marion W. Boyer, '25, Percival C. Keith, Jr., '22, Eugene H. Morrison, '43, Kenneth S. Brock, '48 (Director of the Alumni Fund), James N. Phinney (Executive Secretary of the M.I.T. Alumni Center of New York), Walter P. Frey, '56, and Thomas W. Carmody, '44.

More than 50 M.I.T. Educational Counselors came to Cambridge this spring for a two-day on-campus briefing session organized by students to give their guests "a candid expression of M.I.T. as it exists today." The program included a panel discussion on "Change at M.I.T." with members of the faculty (below), a luncheon graced by Maria Kivisild, '69, President of the Undergraduate Association, pictured with Richard Evans, '70, Chairman of the weekend (below, right), several "smokers" for informal discussion of student issues, and a closing luncheon at which Howard W. Johnson, President of M.I.T., and Vannevar Bush, '16, Honorary Chairman of the Corporation, were honored guests (bottom, right). (Photos: John F. Roderick, '70)

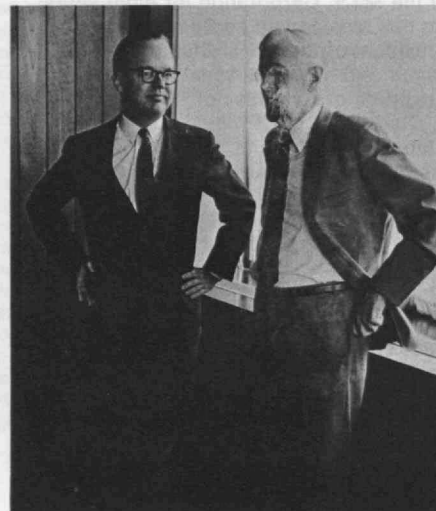


Educational Council: A New Alumni-Student Discussion

A unique dialogue between students and alumni was established this spring when more than 50 members of the Educational Council were guests at an Alumni-Student Weekend on the M.I.T. campus. From Friday noon through most of Saturday there were formal and informal discussions which provided alumni who attended with a candid view of the Institute and its students of today; and the students, too, gained a dimension often missing in the M.I.T. experience—an informal link to the outside professional world.

Each visiting alumnus was the guest of a student host, with whom he attended discussions and in whose living group he was entertained for overnight on Friday, April 19. The formal aspects of the program included an opening luncheon with Howard W. Johnson, President of M.I.T., as speaker; an afternoon session on "Change at M.I.T." with seven members of the teaching staff—Richard B. Adler, '43, Professor of Electrical Engineering, Richard S. Eckaus, Professor of Economics, John C. Graves, Instructor in Humanities, Richard C. Lord, Professor of Chemistry, William T. Martin, Professor of Mathematics, George E. Valley, '35, Undergraduate Planning

Professor, and John Wulff, Professor of Metallurgy—chaired by Irwin W. Sizer, Dean of the Graduate School; and a closing luncheon with Vannevar Bush, '16, Honorary Chairman of the M.I.T. Corporation, as speaker. There were also informal seminars on "Experience vs. the University: the Best Teacher?" and "Extra-curricular Activities" in which the alumni and students joined. M.I.T., said Dr. Bush, is dynamic and ever changing—and for these reasons especially it needs the tempering experience of its alumni to help guide and inform its students who in turn are faced with challenges greater than at any time in the past.



**Alumni Council:
"To Hear the Unheard"**

If effective communication between people is one of the central needs in modern American cities, then public television represents one of the nation's great opportunities, James R. Killian, Jr., '26, Chairman of the M.I.T. Corporation, told members of the Alumni Council at M.I.T. on April 29. The central mission of public television, he said, is to add experiment and diversity to television programming, to free television from the constraints of commercial operation.

It is no chance, Dr. Killian said, that today's concept of public television found its original support from John W. Gardner, who was then President of the Carnegie Corporation. Now, said Dr. Killian, Dr. Gardner is a leading figure in the Urban Coalition, and he is to be a member of the M.I.T. Faculty next fall to help develop the Institute's programs directed toward the urban environment. And public television as envisioned by the Carnegie commission and established by the Congress of the U.S., Dr. Killian said, provides a special opportunity for local television stations to serve local needs, to deal with such special problems as the breakdown of lines of communication in our cities, making it possible for people "to hear the unheard."

As such, Dr. Killian said, public television even in its present format represents "an immense opportunity arising out of technology," and future developments using concepts of interactive television promise markedly to enhance its service.

Meanwhile, he said, there is before the nation the question of how to finance the activities of the Corporation for Public Broadcasting, for it is a new kind of institution in public life and the Congress in understandably concerned for the "governmental relation with a communications medium as powerful as this one." But, Dr. Killian emphasized, "I am confident that a combination of public and private funds will be available" and that the special opportunity of public television can soon be realized for up to 90 per cent of the American people.



When James R. Killian, Jr., '26, Chairman of the Corporation, spoke at the April meeting of the Alumni Council (top, left), his audience included more than 30 undergraduates attending M.I.T. under Alumni Fund Scholarships. It was a special occasion for the students, too, as they visited with Dr. Killian and with Howard L. Richardson, '31, Chairman of the Alumni Fund Board, during a reception period before dinner.

Long Island: Elections and Plans for the Future

Over 80 alumni and wives attended the first annual spring meeting of the new M.I.T. Club of Long Island on Friday, May 3, at the Royal Viking Inn of the Heritage Motel in Syosset, Long Island.

The major attraction of the evening was a talk by New York City's Traffic Commissioner Henry A. Barnes, who is one of the world's prominent authorities on the control of traffic, having served as a consultant in most of the cities in North America as well as in over 20 foreign countries. Commissioner Barnes is noted for his droll manner of speaking and he sprinkled his talk with many hilarious anecdotes, true as well as apocryphal. A second attraction—and the primary purpose of the spring meeting—was the election of a full Board of Directors as proposed by the Nominating Committee: Eliot Bradford, '34, Monroe Brown, '42, John Casey, '40, Marshall J. Corbett, '46, Walter Frey, '56, Joseph Gavin, '41, Theodore Henning, '46, Oliver Hoag, '35, Eric Isbister, '34, Irving Jakobson, '21, Henry James, '27, Edward Keating, '58, Harvey Kram, '42, Floyd Lyon, '42, Robert MacDonald, '48, Bernard Nelson, '35, David Nicholson, '42, Neil W. Perdew, '26, Christopher Rafferty, '35, John Sherman, '31, Robert Dixon Speas, '40, Alfred Wu, '40, Duane Yorke, '53. At a later meeting of the new board, the following were chosen as officers: President, Robert Kraus, '42; Vice Presidents, Stephen Eppner, '45, Adrian Marcuse, '42, and Ned Spencer, '46; Secretary, Joseph Rodriguez, '53; Treasurer, Arnold Whitaker, '46. The officers will also serve on the Board of Directors.

Adrian Marcuse, '42, made three important announcements at the meeting: First, a family picnic is being planned at Babylon Town's Cedar Beach on Saturday, June 29, from 10:00 a.m. to 5:00 p.m. Second, the annual freshman smoker, a barbeque in honor of local members of the Class of 1972, will be held on August 24. Third, an undergraduate summer placement program has been inaugurated with the appointment of Eliot Bradford, '34, Irving Jakobson, '21, and Eric Isbister, '34 (Chairman), as the Placement Committee.

M.I.T. in Mexico A Fiesta and an Anniversary

Two significant 1968 events—not likely to receive much attention in news media north of the Rio Grande—reflect the vitality of the M.I.T. thrust into cultural and economic affairs in Mexico City and the 25th anniversary observance of the establishment of the Institute Tecnológico y de Estudios Superiores de Monterrey, founded in 1943 by a handful of far-sighted Monterrey businessmen, led by M.I.T. graduates.

Fun, Fellowship, and Philosophy

The M.I.T. Fiesta provides a balanced agenda of fun, fellowship, and philosophy during its annual three-day program. In 1968 this occurred on March 14 to 16, when over 80 visiting M.I.T. alumni, their families and friends were feted by the members of the M.I.T. Club of Mexico City with true Mexican hospitality. The Thursday features were a tour of the Colonial Monuments in Mexico City; a get-together luncheon at the University Club, presided over by the President of the local Club, Armando Santa Cruz, '54, ably and characteristically assisted in the introduction of all alumni by Clarence M. (Nish) Cornish, '24; and the sound and light exhibition

at the ancient city of Teotihuacan, dramatically depicting the history of the Pyramids to the Sun and to the Moon.

On Friday luncheon was served in a restaurant overlooking a bull ring where the more spirited members donned appropriate costumes and tried their luck with the cape to the enjoyment of the less venturesome. In the evening at the National University of Mexico all were treated to an interesting lecture by Lawrence B. Anderson, '30, Dean of the M.I.T. School of Architecture and Planning, who suggested that today's students of urban design might well draw upon concepts of ancient Mexican communities in U.S. urban renewal projects.

On Saturday all had the privilege of visiting three private colonial homes in Mexico City before the *Noche Mexicana* held on the beautiful grounds of Louisa and Nish Cornish, most colorfully decorated for the occasion. The local alumni and their wives were dressed in native costumes, and native women were stationed, each with her charcoal burner, preparing her specialty, at various places around the grounds. The M.I.T. ladies arranged and ably demonstrated with their husbands several



Henry A. Barnes, Traffic Commissioner of New York City, was the honored guest of the M.I.T. Club of Long Island for dinner and an informal address on May 3. (Photo: Adrian G. Marcuse, '42)

interesting native dances. A special and spontaneous extra feature was the outstanding performance by Edward H. Davis, '01, who mounted the temporary stage and most capably led all in "Take Me Back to Tech." With the breaking of the pinata in the form of the traditional Tech beaver complete with slide rule and filled with gifts for souvenirs, and with the dancing that followed, the 20th Annual Fiesta came to a close.

One of the sharp points of the M.I.T. thrust in Mexico is kept honed by the driving force of Richard L. Bolin, '50, General Manager of Arthur D. Little de Mexico, S.A. He set up A.D.L.'s office as a one-man operation some eight years ago; today Bolin directs the work of a staff of 10 professionals—"seven of whom are Mexicans," he reports proudly while escorting his visitor through busy A.D.L. offices.

The real thrust of M.I.T. in Mexico where the "truly inspirational work of the Garza and Sada families," many of whose men are M.I.T. graduates, is still a "very vibrant part of the Institute's contribution to Mexican scholarship and industrial growth," Bolin says.

The M.I.T. in Mexico

Both scene and site of the technological institute in Monterrey are tributes to the vigor and vision of Don Eugenio Garza Sada, '14, who, in 1943, convened 23 friends—associates in business and industry—to help him translate his plan for a technological institute into bricks and mortar. He remembered well his M.I.T. experience and wanted that kind of training made available to more young men in his homeland. In September of the founding year, the Institute Tecnológico y de Estudios Superiores de Monterrey opened its doors in the old Spanish House in downtown Monterrey with few students and fewer faculty.

Never before had such an ambitious enterprise in education been undertaken in Mexico with private capital. Few believed that it could succeed without support from public resources; in fact, many scoffed at the project and derided the efforts of its sponsors. Now, a quarter-century later, descendants of

the skeptics seek the counsel of Don Eugenio, less active than he was but not uninvolved as President of the Institute's Board of Governors. He and his associates administer a several-million-dollar educational venture with its many-acred campus graced by beautiful, modern classrooms and laboratories, employing a faculty of some 550 teachers who instruct more than 10,000 students including undergraduates and graduates; far-reaching extension courses offered to secretaries, housewives, bankers, and others; some 1,900 apprentices in welding pipe-fitting, and other sub-professional trades; as well as on-campus preparatory training for some 900 boys. The Institute Tecnológico is recognized as the outstanding engineering school in Latin America, widely known as "the M.I.T. in Mexico."

Although the Institute is something of an energy-supply center, the M.I.T. thrust receives inputs from many other sources in and around Monterrey. The General Manager of Policron de Mexico is Eliot Camarena, '44, formerly Director of the School of Engineering at the Institute. Juan Llaguno, '60, is Finance manager of Nylon of Mexico. His brother, Manuel, '43, is a Director, and another brother, Jaime, '58, is Treasurer of Textiles of Mexico. These, and a score of associates, comprise the closely knit community of M.I.T. graduates in Monterrey, the real pistons of the south-of-the-border thrust.

No account of the M.I.T. contribution to Mexican economic life would be complete unless it included the big share provided by one of the grand old men of Mexican science, Manuel S. Vallarta, '21, Commissioner on the Mexican National Nuclear Energy Commission. Everywhere he is revered for his ability and competence, and the growing company of M.I.T. men in Mexico admire him for his steadfast loyalty to *Alma Mater*.

This report of M.I.T. in Mexico was consolidated from accounts by Clyde C. Hall, former Public Information Officer of the National Science Foundation, and Harold C. Pearson, '23, for the M.I.T. Club of Mexico City.

Deceased

George P. Dike, '99, February 11
Charles K. Flint, '01, May 5
Alice F. Blood, '03, March 20*
Willis S. Caypless, '06, March 16
Rudolf H. Kudlich, '07, April 1
Malon P. Whipple, '09, February 11*
Kenneth P. Armstrong, '10, October 31
Reuben W. Brush, '10, March 23*
Ernest J. Batty, '11, May 7*
Herbert Fryer, '11, December 9*
Sidney L. Day, '12, February 22
Ernest Kerr, '14, April, 1968*
Malcolm J. Sayward, '14, April 24*
H. Nelson Slater, '15, April 25
George W. Tuttle, '16, March 3*
Frank R. Creedon, '18, April 16
Jacob Lichter, '19, February 7*
Gerald H. Mains, '20, November 30
John F. Malone, '20, March 10*
Alexander D. Harvey, '21, January 9*
Adolph B. Alland, '22, December 24*
Clarence L. Scamman, '22, June 25, 1965*
John D. Cochrane, '23, September 26*
Merrill W. Hammond, '23, March 4
Paul V. Heiss, '23, October 31*
C. Calor Mota, '24, April 18
Henry E. Simonds, '24, April 22*
James Elliott, '25, April 13
Watson B. Hastings, '25, March 19
Arthur B. Brand, '26, March 18
Willard M. Woll, '26, December 25
Sidney Gerber, '27, May 16, 1965*
William J. Heymans, '27, May 3
James P. Mitchell, '28, December 20*
Wesleyan Watson, '28, Sept. 22, 1966*
Jen C. Huang, '29, February 27*
Edward D. Martin, '29, November 19*
Charles F. Edlund, '30, March 25*
Arne R. Gudheim, '30, February 9*
William C. Murrar, '30, October 16*
Arthur C. Seelye, '31, March 24*
Herbert L. King, '32, September 30
H. Abbott Lawrence, '32, December 20
Joseph A. Johnson, '33, October 31
Joseph S. Lukesh, '36, February 16
Joe Stearns Clark, '37, June 5, 1966
Peter J. Sosa, '41, December 3
Robert M. Greene, '43, March 29
Leonard F. Glancy, '44, March 19
Fred V. Paradise, '47, February 5
Lemuel W. Mason, '48, October 13, 1966
John K. Williams, '50, December 8
Edward S. Carter, '51, February 10, 1967
Charles H. Horn, '53, April 22, 1967
Jacques J. Schorr-Kon, '57, 1967
George K. Shook, '65, January, 1968
*Further information in Class Review

Class Review

95

We are happy to report that we had a telephone conversation with **Luther Conant** who is in a nursing home in Norwalk, Conn. He is confined to his bed, occasionally getting to the window. He is 96 years of age and when I told him I was able to get out almost every day at 94½ years of age he referred to me as "a young fellow." It was a real pleasure for me to talk with him today, May 6, as we are the two remaining members of the Class of 1895.—**Andrew W. Fuller**, 1284 Beacon Street, Brookline, Mass. 02146

96

Last month we sadly reported the death of Rear Admiral **Ruben E. Bakenhus**. While attending M.I.T. he lived on Chandler Street in the same house as **Harold Boardman** and **Nathan Grover** (graduates of the University of Maine who took fourth year civil engineering with our Class). Bakenhus was one of two students in the Class who accepted Professor Swains' challenge to design the State House dome; the other was **Charles Wentworth**, who later became a Lieutenant in the Civil Engineer Corps of the Navy. When working in the Boston office of the Metropolitan Water Works, Bakenhus once walked over the aqueduct to view its construction from the Nashua Dam to the open channel where it cut through the Choate Farm.

Your Secretary recently attended a dinner of the M.I.T. Club of Boston where John F. Collins, former Mayor of Boston, was the speaker. He is now Visiting Professor of Urban Affairs at M.I.T. Professor Collins said that the New York Legislature has quite recently passed an act establishing a corporation for development, of which Mr. Edward Logue is Executive Director. This corporation has the authority to regulate and advise concerning operations and actions in respect to federal law. The talk was excellent, attentively received by the members and guests present, and enthusiastically applauded.—**James M. Driscoll**, Secretary, 129 Walnut Street, Brookline, Mass.

98

Willard B. Nelson writes: "Keeping well and able to enjoy myself and my friends. My great-grandson is entering high school. The last of my three granddaughters was married in February. I shall not be able to attend the Reunion. Not for any reason of health, but because of other things happening at that time. Please report to those who are there that I am blessed with excellent health, entirely ambulatory—drive a car and boat. My daughter, granddaughters and great-grandchildren keep me young. Greetings to classmates."

Mabel Forrest Lambert is sorry she could not attend the Reunion. Lameness keeps her at home in Lowell, Mass. She wrote in the spring: "Since Dr. Lambert's death, my daughter Elizabeth and I live alone with various dogs and cats. Sometimes relatives visit temporarily from near and far. Interests are my family including six great-grandchildren, the birds, and the many seeds to plant and flowers to grow. Isn't it fortunate that when the stock market fails, the birds do not!" Her daughter added an outline of her mother's life. "Following graduation in '98 (Life Sciences) Mabel Forrest taught biology in the Rogers Hall School for Girls in Lowell, living with her widowed mother until her marriage in 1902 to Dr. John H. Lambert, who attended M.I.T. for two years. They finished building their house in Lowell in 1909. Mother had much to do with the design, a colonial reproduction, and planned the landscaping herself. It is still a great joy to her to sit out in the garden, a bit of country right in the city. By 1914 five children were born and her mother was by then living with her, so we were a busy household of eight. My father was exceedingly busy on the staff of the Lowell General Hospital (put in the large x-ray machine there), with his own practice and being Chairman of the School Board was little at home leaving to my mother and us children the care of the place. She also helped him with secretarial work, saving medical articles, and answering the phone and locating him for emergencies. Then came World War I and he went overseas in charge of the B.U. Base

Hospital Unit, fluoroscoping by night for bullets and operating by day. The hardship of the war left him with asthma for years. However, they kept up their love of out-doors and later they both rode horseback. My mother managed to be active in the community, helped to form the first College Club in Lowell, was Treasurer of the Society of Prevention of Cruelty to Children and active in scouting. Then followed the years of schools and colleges for the five children. Now my older brother John H., Jr., is Chief Forester of Massachusetts, married, and has three married sons. My mother's second son, Benjamin, is a surgeon on the staff of the Lowell General Hospital and has a family of two boys and one girl, all married. Ruth, a psychiatrist, married George Bromberg, commercial artist, and they live near Chicago. They have four grownup children. Mother's fifth child, Anne, now Mrs. Don W. Phillips is living with her two teenage children in California. As for myself, I worked in neuro research in several medical schools, later in the local pathological laboratory (which pleased my father as he had been asked by the state to start the first Cancer Clinic in Massachusetts). Since my father's death in 1949, I have been most of the time at home with mother. After two years of cancer research, I have had part time jobs which enabled me to have time to help with the gardens and housework. Mother stayed quite active in her eighties, indoors and out. She was at her 92d birthday party on Christmas day at my brother's."—**Audrey Jones Jones**, Acting Secretary, 232 Fountain Street, Springfield, Mass. 01108

99

George P. Dike was born January 20, 1876, and died February 11, 1968. He trained as an attorney at Harvard Law School, and specialized in patents and trademarks. . . . **Frederick W. Grover** plans to visit two of his sisters, one in New York State and one in Tryon, N.C. . . . **Norman E. Seavey** is planning an interesting trip. He will sail through the Panama Canal and then north to Acapulco, Los Angeles, San Francisco and Vancouver. He then will travel to New Zealand, Australia, Japan, Hong

Kong, Honolulu and back to Vancouver. He will also go to Montreal. Norman hopes to be able to attend some of the meetings of various M.I.T. clubs. Our President is a good example to the men of M.I.T.—**Percy W. Witherell**, Secretary, 1162 West Street, Wrentham, Mass. 02093

00

At last we have heard from a few of our 23 classmates still living. **Walter L. Rapp** writes from 3438 Vista Avenue, Cincinnati, Ohio: "Thank you very much for your kind birthday greetings. I was sorry to learn that you are troubled with arthritis. My legs are also somewhat stiff after sitting for awhile. I am glad that I still have my old 'M.I.T. 1900' class cane to use as a stabilizer when I walk. Last year I had an electric elevator installed and I find that it is much easier to push a button than to climb or perhaps tumble down the stairs and then be laid up at a hospital with broken bones. I am still in the old house, which I altered back in 1921, and enjoy it very much for the many associations which it has. Unfortunately, Mrs. Rapp died about eight years ago. I still love my flower garden and a few weeks ago had my yard-man plant sweet peas again. I never would feel happy in a hotel room or apartment. If you should run into some of my 1900 friends that may remember me (at one time Class President) give them my best wishes and let them know that I am still alive and kicking."

Nathaniel D. Rand sends "greetings to the remaining members of my Class." He writes: "It was certainly good to hear from you but the news that you were in the hospital is disheartening and I hope by now you have fully recovered and are enjoying good health again back in your home. My wife had acute arthritis several years ago, but the doctor cured her and it doesn't bother her anymore. Hope you will be that fortunate. At present I cannot lead a very active life (in my 90th year) but I enjoy putting in my garden which is my pride and the joy of my neighbors. My indoor hobby is my stamp album and I write articles for a science teacher who teaches fifth and sixth grade pupils. I am now preparing an article on electrical batteries and magnetism, thanks to my Tech instructors, Clifford and Cross. My youngest son, a retired Air Force Major, is an executive with a corporation in California. My elder son and his charming wife live just outside of Washington, so we see them quite often. I also have four great-grandsons. I don't drive the car a great deal these days, mostly just errands because frankly I'm afraid of the teen-age hot rodders on the road."

We have heard indirectly that **Walter Kattelle** had a slight stroke last fall which left his left arm and leg somewhat affected but that his bright mind and good sense of humor are still active. He celebrated his 90th birthday on

April 16 by having a dozen friends at his home.—**Elbert S. Allen**, Secretary, 11 Richfield Road, West Newton, Mass.

03

This month we are fortunate in having the biography of another classmate, **Adolf Edwin Place**, I, of Boulder City, Nev. Adolf first entered M.I.T. in January, 1900, as a junior. Unfortunately, due to an illness he acquired in the Adirondacks during his summer vacation, he could not study in 1902. However, he returned to M.I.T. in 1903 and graduated with our Class. Upon graduation Adolf became an engineer in the Hydraulic Department of the United States Geological Survey in Washington, D. C. In subsequent years he worked a great deal in Colorado and Montana. The newly organized U.S. Reclamation Department then drew him to Denver, Colo. In 1908, at the request of his father who had taken over a gold mine in Oaxaca, Mexico, Adolf founded the engineering firm of Place and Elton, which was involved in the care of mines for absentee owners. The Revolution began in 1910, so this partnership was dissolved and Adolf became Consulting Engineer, Water and Sewerage, in Oaxaca. At this time the Mexican port of Veracruz was attacked and occupied by U.S. soldiers. Because of Adolf's fluency in Spanish he was appointed Chief Engineer and Inspector of the city of Veracruz. When the U.S. Army was withdrawn in November of 1914 Adolf returned to Oaxaca only to find that all of his property had been confiscated.

He then traveled to Los Angeles, Calif., and remained there as a consulting engineer until the financial crash of 1929. After the crash Adolf went to Yukon, Alaska, and worked as Manager of Placer Gold Mines; but the financial crisis extended to Alaska too and his contract was dropped. In 1931 Adolf lost his wife to whom he had been deeply devoted for 28 years. Undaunted, Adolf next succeeded in managing a small gold mine in Nevada which grossed a million dollars between 1938 and 1942. The mine was later closed by the government. Adolf was next employed by the U.S. Bureau of Mines, Boulder City, Nev. Here he managed a 1000 ton per day ore plant until after World War II. Mexico held great appeal for our classmate and it was to Mexico he returned to become manager of a lead mine. He also opened a consulting office where he was kept busy until 1960 when he retired and returned to Boulder City. Adolf, who will be 92 years of age on next December 21, extended best wishes for our 65th Reunion and wished he could have been with us.

Alice F. Blood passed away on March 20 after a long illness. She was born in Lynn, Mass., and lived in New Hampton, N. H., for 27 years. After graduating from M.I.T. in 1903, she received the doctor of philosophy degree from Yale University. Dr. Blood was an Instructor

at Simmons College, and Director of the Home Economics Department there for 31 years. She was also President of the Home Economics Association, a job which involved much editorial work for the Houghton Mifflin Publishing Company. After her retirement and move to New Hampshire, Dr. Blood became very involved in civic activities in New Hampton. She leaves a sister, Mrs. Lewis Clough of Laconia, N.H., and many nieces and nephews. . . . Other classmates who are no longer with us include: **Marshall H. Washburn**, 537 Barberry Lane, Louisville, Ky., deceased, March 18; **Charles L. Bates**, 2680 West 8th Avenue, Vancouver, B.C., deceased in March; and **Daniel C. Picard**, Route 1, Stuart, Fla., deceased on February 6.—**John J. A. Nolan**, Secretary, 13 Linden Avenue, Somerville, Mass.; **Augustus H. Eustis**, Treasurer, 1428 Canton Avenue, Milton, Mass.

04

Our traveling Vice President is on the roam again. We received a note from the M.I.T. Club of Mexico City informing us that they had the great pleasure of having our classmate **Amasa Holcombe** and his wife Martha with them at their 20th Annual Fiesta. We also received a card from the Holcombes from Sarasota, Fla., where they were attending a S.A.R. State Society meeting. The previous week they had attended the Mayflower Society meeting and the M.O.W.W. (World War Officers). The following week they planned to attend Martha's 50th Class Reunion at George School near Philadelphia. . . . A letter from **Frank Davis** mentions the loss of some of our classmates reported in previous issues of the *Review*. Frank says: "I am very fortunate to be still going and alive. I have been on crutches for the last three years, and have not driven the auto on public highway since December, 1965, although I drive the jeep on the roads inside the ranch fence everytime I go up there. The ranch is six miles long and three miles wide and has three small lakes and nine miles of the Black River. My son and daughter take me out in the boat to fish. I still have my desk in the office and attend some of the meetings but do not get out in the plant much. I do not go to shows and symphonies, etc., what I get of them is over the T.V. T.V. is a wonderful invention. We have not had newspapers in Detroit for some time, but my eyes have failed so I don't read them much anyhow. I get enough 'news' about the war and the Presidential campaigns over the T.V." . . . We have one death to report this month, that of **Harcourt W. Bull** on March 3, 1968, which was reported by his daughter.—**Eugene H. Russell, Jr.**, 82 Stevens Road, Needham, Mass. 02192

06

Our busy Class President, **Sherm Chase**, has been a regular member of the Alumni Council for some years—representing

the Knoxville Club. When I phoned and asked him if he would join me at the council meeting on April 29 he said he couldn't because of another important meeting that evening. It seems that among his other activities and offices held, Sperm had been a longtime President of the Auburndale Community Association—like the Village Improvement Societies that were so prevalent in eastern Massachusetts years ago. But at the meeting that night he was not to be re-elected—somebody else finally took over! Shortly before that, Bertha was in the hospital for a little surgery—has had a normal recovery—and accompanied Sperm to Cleveland in June when he received the British Friendship Medal. . . . One classmate heeded my pleas for news—**E. B. Bartlett**, VI. Ed has his A.B. from the University of Wisconsin when he joined our Class. He has been retired since 1944, and with his wife, Julia Foster whom he married in 1916, spends the winter in an apartment in Phoenix. His major activity now, he says, is duplicate bridge "and am reasonably *successful* at it." Just what do you mean, Ed? . . . In the June notes I referred to a letter I had received from Guy Ruggles, Jr., and he wrote me again late in April enclosing a copy of the material about his father that he had assembled and sent to the Arizona Section of the American Institute of Mining, Metallurgical and Petroleum Engineers. He had evidently done considerable research—and Guy must have kept detailed records—for he also enclosed a year-to-year table (1906 to 1959) showing for each period the position Guy had held, his employer, and the locations, in five or six states and Mexico. Guy's son also believes his father lived a full and profitable life.—**Edward B. Rowe**, Secretary-Treasurer, 11 Cushing Road, Wellesley Hills, Mass. 02182

07

The *Review* editors returned with regrets the article on **Maude Darling Parlin** that I had sent them, stating that they did not have space this year to publish it. They did reproduce her picture on the page adjacent to the '07 notes in the May issue of the *Review*. . . . **Kirk Dyer** answered my request for information about children, grandchildren, and great-grandchildren. The Dyers have two boys and two girls. They in turn had six girls, and now there are eight great-grandchildren. . . . **Dick Ashenden**, II, accompanied his check with an interesting letter. He and Mrs. Ashenden have recently attended the 65th anniversary of their graduation from Newton High School, where they both were in the same class. They are now looking forward to celebrating their 60th wedding anniversary this coming October. They have five grandchildren and four great-grandchildren.

Tommy Gould is not well and has to spend a great deal of time in bed. He recently had a second operation and is not recovering from it as rapidly as he

should. I suggest you send him a "get well" card. . . . **Phil Greenwood** had a major operation last fall, and as he was recuperating he was treated for a severe sore throat by being given penicillin. He proved allergic to it and had a very rough time for many weeks. He now wears a 'Medic Alert' bracelet as a safeguard. The Greenwoods have a married son and daughter and three grandchildren who are still attending educational institutions. . . . The **Paul Cummings** family has returned from their four months' visit to Majorca, Spain. While there they had several social gatherings with six other Tech men and their wives. Mrs. Cummings writes for Paul who has poor eyesight. She spoke of a special dinner party they had at the beautiful home of Randall Cremer, '18. The Cummings family have 11 grandchildren, nine boys and two girls. . . . It is always pleasant to get a note from **Bob Taylor**, XI. He and I worked together for some months on the Beacon Hill Tunnel of the Cambridge subway, many years ago. Bob is still active as a consulting engineer in settling claims for damages caused by the construction of buildings. . . . **John Bradley**, VIII, recently attended a meeting of the Mining Metallurgical and Petroleum Engineers and was awarded a Certificate and a Legion of Honor gold lapel pin for 50 years of membership in that organization. . . . As a result of my request for financial help to keep the Class a going institution, I have received 33 replies out of the 74 I mailed out. These all included checks—a total of \$280. The next set of notes will contain an account of Alumni Day and a record of the '07 members that attended it.—**Philip B. Walker**, Secretary and Treasurer, 18 Summit Street, Whitinsville, Mass.; **Gardner S. Gould**, Assistant Secretary, 409 Highland Street, Newtonville, Mass.

09

Ben Pepper and Barbara have returned to their summer home at Crow Point, Hingham, after having spent three months at Santa Barbara, Calif. Their son, Edward L., '42, has just been promoted to Vice President of the Arthur D. Little Company. The Class extends congratulations to him. . . . We have received a notice from the Alumni Office of the death of **Malon P. Whipple** which occurred on February 11 at his home in Solon, Maine. Malon prepared for the Institute at Solon High School and Bowdoin College, from which he graduated in 1907. At the Institute he was a member of the Chemical Society and the Bowdoin College Club. Our records give little of his professional career. His address for many years was Newtonville, Mass., and in 1951 he moved to Solon, Maine, his last address. We have written to his widow expressing the sympathy of the Class as well as our own. . . . The Secretary and Muriel left for Hawaii in late April where they spent three weeks. . . . These are the last class notes until November. The class officers wish everyone a most pleasant

summer.—**Chester L. Dawes**, Secretary, Pierce Hall, Harvard University, Cambridge, Mass. 02138; **George E. Wallis**, Assistant Secretary, 185 Main Street, Wenham, Mass. 01984

10

G. H. Little of Herkimer, N. Y., writes that he has been fairly well and enjoys his yard and six grandchildren. He would enjoy hearing from any classmates. His address is 517 Renwick Avenue, Herkimer, N.Y. 13350. . . . **Ludwig Rosenstein** writes: "I am pleased to report that at age 82 I am alive and active. Today notice was received of the allowance of a patent (jointly with Dr. Manuel H. Gorin) dealing with vapor-compression distillation, especially for desalination. Beside some theoretical (and quite amateurish) statistical work, I am also the representative of D. R. Sperry and Company in this territory. C. H. Mohr, '33, is Executive Head of this firm. Recently I had a nice card from Elliot Q. Adams, '11. Adams and I were the first to receive Ph.D.'s in Chemistry from the University of California. This was in 1914. . . . Mrs. R. Warner Brush writes: "I have sad news to report, that of my husband's death on March 23, 1968. Although he had been crippled with arthritis for several years he was not an invalid—his mind was keen, and it was wonderful that he could die at home suddenly, with no hospitalization." . . . Notice has been received of the death of **Ralph Hilscher** on December 17, 1967; also notice of the death of **Charles E. Meulendyke** sometime in 1967.

Achilles Hadji-savva advises that his new address is Hotel Palladian, 54 Panepistiminou Street 54, Athens, 142 Greece. . . . **A. T. Cushing** of Kansas City, Mo., writes that he wrote to **Kenneth P. Armstrong** and received his letter back marked "deceased." He forwards the enclosed poem for us all: "Since I've retired from life's competition,/ I busy myself with complete repetition;/ I get up in the morning, dust off my wits,/ Pick up the paper and read the 'Obits.'/ If my name is missing, I know I'm not dead,/ So I eat a good breakfast and go back to bed." Cushing continues; "You say you are re-retired; Possibly I can say the same. After being retired from the U.S. Government on a pension, I got a job on the rehabilitation of a war plant, that lasted three and a half years. It pays no pension, but did qualify me for Social Security checks. The verse above is from a poem, *My Grand Old Age*. If you would like other verses, let me know and I will type them for you."—**Herbert S. Cleverdon**, Secretary, 120 Tremont Street, Boston, Mass.

11

I heard through **Harold Robinson** of the death, last December 9, of **Herbert Fryer** at his home in Carnation, Wash. (RFD Box 16, Route 1, 98014). Herb was born in Haverhill, Mass., October 28, 1889.

He prepared for Tech at the Stoneham High School and graduated from Course VI, Electrical Engineering. I understand that Ethel Fryer will continue to live in their old home. Herb Fryer was best man at the Robinson's wedding 57 years ago and remained a close friend over the years. Harold L. Robinson was born in Boston, March 31, 1889. He prepared for Tech at Winchester High School and graduated from Course I, Civil Engineering. He was in construction work from 1911 to 1918 with Aberthaw Construction Company, Swift and Company and others. From 1919 to 1924 he was with Crompton and Knowles Loom Works as Personnel Manager and as Stores Manager. In 1924 Harold opened an office in Worcester doing civil engineering and consulting work. He continued this work until March, 1954, when, having suffered a coronary the previous year, he turned the business over to his son who is still continuing it successfully. For a couple of years after that, Harold took a temporary position as Assistant Manager of the Safe Deposit Department of the Mechanics National Bank of Worcester. A hemorrhage back of his eyes forced him to retire for good in 1956. Since then he and Frances have spent their winters in Florida until last winter when they spent it in Jaffrey Center, N.H., not feeling able to travel to Florida. The Robinsons have two sons and a daughter and eight grandchildren. Harold enlisted in the Air Corps in 1942 as an Administrative Officer and was discharged in June, 1945, as a Major.

Ernest J. Batty of Mashantum Road, Dennis, Mass., died May 7, a few days after his autobiography appeared in the class notes for May. Ernest and I took our first job together at the American Writing Paper Company in Holyoke, worked together in 1917 and 1918 at the Sayles Finishing Plant in Pawtucket, and for a few years in the 1920's were associated in architectural work in Quincy. Ernest's wife Bertha and my wife Alma have been life long friends. . . . Since writing, a couple of months ago, about **Lloyd Cooley's** trip to the Far East, I have heard indirectly that he received honorable mention in the Travel Category at the Union League Exhibit for a photograph he took while on that trip. . . . **Livingston Ferris** and Mary were hosts on their plantation to the Louisiana Press Women. Ashton Plantation has been owned by Ferris's family since before the Civil War. The present home was built soon after the war by Livingston's grandfather and is a remarkable house of eight rooms, seven with usable fireplaces, and a 12-foot-wide gallery running nearly all the way around the building. Livingston has put in a heat pump for added heat in the winter and cooling in the summer. As might be expected, there are many heirlooms handed down by the Polk and Ferris families. The enormous grounds are beautifully landscaped and include many live oaks, two of which are registered as members of the Live Oak Society under the names "Livingston" and "Polk." There is a large deep toned

bell mounted on a tower which dates back well over a century, and which used to be used to summons the help. Ashton was originally a sugar plantation with its own sugar mill where the cane juice was boiled down in large cast iron kettles. The kettles are now lawn ornaments.—**Oberlin S. Clark**, Secretary, 50 Leonard Road, North Weymouth, Mass. 02191

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Do you remember Pa Lambirth, our freshman instructor in forging? Many of us who were not too good in the blacksmith's art soon learned that the easiest way to complete an assignment was to let Pa do it for us. Whenever he saw some one struggling with a piece of heated iron that he was forging, Pa would sing out, "Iron is devilish hot, boy!" and taking it from him would complete the job quickly with a few well placed blows, shouting, "Always strike light when you miss!"

On our way home from Florida we stopped off at Myrtle Beach to visit our old friend, **Hugo Hanson** and his wife, Edith, who entertained us in their charming home at Briarcliff Acres among the pine trees of South Carolina where they have been living for some two years. We had a nice chat, recalling old times and classmates, and Hugo showed me an old photo of classmates in Course X, most of whom we could identify. Hugo recently suffered another heart attack which, while slight, has induced them to relocate in a still warmer climate where there is less outdoor maintenance. They are, accordingly, planning to move to a new apartment, condominium style, at St. Petersburg Beach, Fla. . . . **Howard Cather** took his usual winter trip south this year, visiting Long Island in the Bahamas with two other couples. During a fishing trip he hit the jackpot, landing a 40-pound

grouper. His fishing partner hooked an even larger fish, probably weighing about 70 pounds, but before he could land it a 15-foot tiger shark pulled it from the hook. Congratulations, Howard! My record this year was a grouper, but weighing less than 10 pounds.

From **Jesse Hakes** we have a note advising us that he and Mary have returned from a wonderful three months cruise on the *Sagafjord*. They visited 20 ports along the African and South American coasts, including Cape Verde Islands, St. Helena, Capetown, Durban, Montevideo, Buenos Aires, Valparaiso, Balboa and Christabel. This was their ninth cruise and both are most enthusiastic about a vacation of this type. Jesse is now keeping very busy at home with his large nursery, known as Ellerslie, in Glendale, Md. He forwarded an illustrated catalogue, indicating that he is striving to keep Maryland beautiful with his large assortment of azaleas, rhododendrons, dogwood and junipers. He and Mary are most interested in this venture and belong to several horticultural societies, attending their meetings regularly. The colored photos, taken by Jesse, show that in springtime their estate is a fairyland with many shrubs in bloom. He recently received an enjoyable visit from **Dave Guy**, his wife Iva and daughter Joan. . . . **John Barry** writes to tell us that he started his business career in a shoe factory in Binghamton, N.Y., along with **Arch Eicher** and **Ken Cartwright**. He soon transferred to the Waterbury Clock Company, then to the Scoville Manufacturing Company and to National Conduit and Cable Company (with **Don Kemp**, our freshman Class President). These ventures were followed by a financially disastrous experience making hosiery in Taunton, Mass., in competition with the South. He finally settled down with Cynthia Mills, Inc., Boston, producing hand knitting and embroidery yarns, where he spent 26 years,



Hugo Hanson, '12 (left), and Ray Wilson, '12 (right), were photographed this spring at the Hanson home, Briarcliff Acres, in Myrtle Beach, S. C.

becoming Treasurer and Manager. John says: "Although none of these positions had much connection with electrical engineering, I still think that Course VI offered excellent training for most any kind of a vocation." The Barrys were married in 1914 and have celebrated their 54th anniversary. They are both in reasonably good health. Their family includes four married daughters and 12 grandchildren. Since retirement in 1951 they have traveled considerably, not only in this country but in Mexico, Europe and South America. John has been active in the United Community Services in Boston and served as Trustee of Derby Academy and the Hingham Public Library. His other interests include music and for many years he played clarinet in the orchestra of the Harvard Musical Association. Referring to Arch Eicher's article in the April issue regarding the freshman band, John says he collected 75 cents an hour as chief musician "while you poor devils drilled for nothing."

Phil Dalrymple still maintains his connections with Jackson and Moreland, a consulting engineering firm of Boston, now a division of United Engineers and Constructors with whom he has been associated since 1939. Phil is in charge of Machine Design. He tells me that recently work in the office has quieted down and he has had a little free time which he has used to catch up with some of the tasks about his home that have needed attention, a few of them for as long as 18 years. He and Henlena were married in 1916 and both are in good health and active, not yet having learned how to slow down. They have four married children. The two boys live in New Orleans and in Baltimore; the girls in Puerto Rico and in Needham, Mass. There are nine grandchildren and the oldest, a boy, was married in April. With such a widespread family, they try to visit around—the last such trip was to Puerto Rico last winter. They have a summer home in Georgetown, Maine, across the bay from Boothbay Harbor, and Phil says that this will be the first year he hopes to be able to enjoy a full vacation. Take it easy, Phil!

Jerry Hunsaker, our most well-known classmate, tells us he joined our Class in 1909 when he was assigned by the Navy for the graduate course in Naval Architecture. He graduated from the Naval Academy in 1908 and had just returned from a year at sea on the cruisers *North Carolina* and *California*. Among other ports he called at Panama and witnessed the Canal being dug. The Naval Architecture course was located in a building near the Trinity Place Railroad Station which was pretty shabby, dirty and noisy. He studied under Professors Peabody and Hovgaard who were outstanding and stimulating instructors. His next job was to design a gun boat to run the Yang Tsi Gorges, even in time of spring freshets. This meant high power, small propellers and an oversized

rudder. He married Alice Avery in 1911. Alice passed away in 1966. They had two sons and two daughters. Tragically, his son Peter, a pioneer in liquified gas development, was killed by the explosion of a refrigerated, liquified high-pressure tank being tested for Arthur D. Little. Jerry was Commander in the Construction Corps of the Navy to which he was assigned from 1909 to 1926. During this period he served as Instructor at M.I.T. in Aeronautic Engineering (1912 to 1916) and was then put in charge of Aircraft Design for the Navy Department in Washington where he designed the airship *Shenandoah* and the flying boat NC4 (the first to fly the Atlantic). From 1923-1926 he served as Foreign Navy Attaché. He then worked for the Bell Laboratories for two years on air services and spent seven years as a Vice President of Goodyear-Zeppelin. From 1933 to 1951 he headed the Departments of Aeronautic Engineering and Mechanical Engineering at M.I.T., and he is now Professor Emeritus, still maintaining an office at the Institute. In the Navy he ranks as Captain, U.S.N.R. (retired). Reference to *Who's Who* reveals that Jerry has received an amazing number of degrees, awards and medals during his distinguished career. He holds Sc.D. degrees from Tech, 1916, from Williams, 1943, and from Adelphi, 1955; also E.G.D. from Northeastern, 1945. He has been awarded the Navy Cross, the Medal for Merit and the Navy Award for distinguished public service as well as several aeronautical and service awards from societies in the United States and Great Britain. Jerry is also a member of the French Legion of Honor. Last year he was elected to the National Academy of Engineering, a private organization advising the federal government on scientific matters. With all of these achievements he is most unassuming and has always been a very loyal member of our Class, attending all reunions. His comment regarding the above record, "Pretty stuffy, no doubt!" Our sincere congratulations and best wishes, Jerry! . . . **Harold Mabbott** has recently returned from the hospital where he spent six weeks following an attack due to circulatory causes. He is now at home and is apparently recovering satisfactorily. Our best wishes for a complete recuperation, Harold.

This is the last issue of the current volume of the *Review* and we are most pleased to have achieved our goal of at least one page of 1912 news per issue. Our hearty thanks to all whose contributions have made this possible. It has not been an easy task, however—in fact we almost lost out on this issue, despite many individual requests for material from your Secretaries. We have received a number of letters expressing appreciation and interest in the expanded news issues and hope that with this fine start we can so continue next year. Most of us now have more leisure time and we urge each of you to make a special effort

right now to send in something of interest no matter how brief, rather than to postpone writing until September. There are still many from whom we have not heard who can furnish a story of interest to their classmates. With this brief "lecture" we are retiring until the fall. A very happy vacation to you all—and keep well!—**Ray E. Wilson**, Secretary, 304 Park Avenue, Swarthmore, Pa. 19081; **Jay H. Pratt**, Assistant Secretary, 937 Fair Oaks Avenue, Oak Park, Ill. 60302

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Florida newspapers in April contained news of the deaths of two of our well-known classmates. The clipping from Clearwater notes: "**Earnest Kerr**, of 880 Mandalay Avenue, Clearwater Beach, died Saturday. A native of Fox River, Nova Scotia, Canada, he came here 12 years ago from Providence, R.I. He was a retired fire insurance company executive; was a member of First Church of Christ Scientist, Clearwater, and the Mother Church of Boston, Mass.; was a member of the Clearwater Country Club, the Clearwater Yacht Club; and was a graduate of M.I.T., Class of 1914. Survivors include his widow, Mrs. Sara P. Kerr, and a son, Booth Kerr, Tampa." . . . The other news clipping records the death of **Malcolm J. Sayward**, "Belleair Bluffs, Fla.—Malcolm J. Sayward, of 2394 Indian Avenue, died Wednesday (April 24, 1968) at Arcadia. Born in Hyde Park, Mass., he came here six years ago from Groton, Conn., and was a draftsman for General Dynamics. He was a member of Groton Congregational Church, and the Y.M.C.A., New London, Conn. He was a graduate of the Massachusetts Institute of Technology, Class of 1914, and was a member of the Marine Draftsmen's Union. Survivors include his widow, Mildred, Belleair Bluffs; a daughter, Mrs. Robert C. Hitchens, Seaford, L.I., N.Y.; a stepson, Edward Wilke, Orange Park; five grandchildren; and a sister, Miss Marion Sayward, Cleveland, Ohio." Our records also indicated that Malcolm spent some time after graduation with the Commonwealth Steel Company of Granite City, Ill., later moving to St. Louis and subsequently back to Massachusetts and Connecticut before his retirement to Florida.

Here are a few notes gleaned from answers to the reunion questionnaire. **Levi B. Duff**, who is Director of Allegheny County Department Works, Pittsburgh, Pa., notes: "I am still in there pitching for Allegheny Company. In February, 1968, I drove to Akron, Pa., to spend the weekend with **Walt Keith** and Fama." . . . Here's a cheerful note from **Earle O. Turner**, from Sarasota, Fla.: "It is always nice to hear that fragments of our old Class are still keeping up the *esprit de corps*. My history since retirement has been unexciting for the most part. I have had one heart attack, and preventive surgery to head off can-

cer, but still play 18 holes of golf and since my pals are growing old just as fast as I am, the competition is still good. It could be interesting to relate that in 1955 when I was President of the Royal Canadian Golf Association I had the happy experience of presenting Arnold Palmer his first winning check—\$2500 for winning the Canadian Open at the Weston Country Club outside Toronto. After retirement in 1957 my winters have all been spent in Florida.”

Raymond D. Maccart notes from Harbor House, 506 Pompano Beach, Fla.: “In that I have an apartment in Washington, D. C., and also in Pompano Beach, Fla., I divide my time between the two locations. At present I am living at the latter location, needless to say. In my spare time I am a student of the Stock Market along with many other retired friends who have the same hobby. It’s a good way to keep mentally alert and away from the go-go places.”

Harold Richmond and Florence are on a round-the-world cruise which will take them from April to August.

James B. Reber writes from 8 Briar Hollow Lane, Houston, Texas: “For the last 11 years I have lived each year for eight months in Houston, Texas, and four months in Auburn, N.Y. I am still a resident and maintain a home and vote in Auburn, N.Y. Most of my time is spent in traveling, playing golf, raising azaleas, camellias and roses in Houston, where they thrive profusely. By living in Houston I am able to follow sports comfortably in all kinds of weather in the Astrodome, such as football, baseball, polo, bull fights, and so on. In the new Jesse James Hall we see operas and the Houston Symphony Orchestra. Best regards and hope to see you in 1969 at our 55th.”

A note from **Henry F. Merrill**, Christian Hill, RFD 1, Milford, N.H.: “News about myself!—Retired from Standard Vacuum Oil Company in April, 1945, after 26 years in China, mostly in Shanghai. Married Kathleen B. Atkins of Vancouver, British Columbia, Canada in 1919. Our two daughters were born in China. The elder, Mrs. Phyllis M. Klehm, is now Registrar of her Alma Mater, Principia College, Elmhurst, Ill. The younger, Mrs. Elizabeth M. Wight, married M. Arnold Wight (M.I.T. 1940) and is now living in Amherst, N. H., where we live. My wife and I retired to this 40-acre farm, (unworked) which is in Amherst, regardless of the fact that our postal address is Milford! I have filled several town offices over the years including Trustee of the Trust Funds of the Town of Amherst and have served for nine years as Secretary-Treasurer of the Town Library. My wife and I are now living a happy, quiet life in the country.

“With best regards to the members of 1914.”—**Herman A. Affel**, Secretary, Rome, Maine, Post Office RFD 2, Oakland, Maine 04963

15

The Class Supreme again proves itself Supreme with a column of interesting notes, following the scarcity of the last few months. Get ready—plan and save for our 55th Reunion on the weekend of June 12-15, 1970! Detailed notices will be sent you later. Meantime, all the best to the fine 1913 Class for an enjoyable and successful 55th at Coonamessett Inn, Cape Cod. They were our coaches and mentors for our Freshman Field Day, helping us to win the day. . . . On April 26, 18 classmates met at The Chemists’ Club in New York for our Annual Class Dinner there. **Larry Landers** set this up for us and deserved the resounding applause he received for his interest and efforts in making this such a pleasant and interesting evening. After a cocktail hour, the old Pirate, lean, lethal and light as ever, opened the dinner with his nostalgic “we are happy” cheer. Present were Dick Bailey and Henry Daley from Philadelphia; Stan Osborn from Hartford; Gerry Coldwell, Ralph Hart, Gil Peakes, Ray Walcott, and Speed Williams from New York; and Larry Bailey, Horatio Lamson, Larry Landers, Azel Mack, Archie Morrison, Frank Murphy, the Pirate and Gerry Rooney, Wally Pike and Bill Smith from Boston. We greatly missed a number of the regular attendees who could not be with us. Several wrote their regrets—We’re slowing down with the toll and attrition of age. There was no singing this year and the post-prandial meeting in our upstairs headquarters room broke up at 10:15 instead of 1:15, as in our younger days. It was a pleasant, relaxing and friendly evening, typical of the wonderful spirit of closeness, camaraderie and friendship that makes our Class so outstanding. For us from Boston, it’s a yearly celebration—the train ride over and back, the comfortable Chemists’ Club, the evening with classmates and the Saturday morning sightseeing in New York. This year we watched the Loyalty Day Parade on Fifth Avenue. About the New York trip and dinner **Larry Bailey** wrote: “I always enjoy the trip and the fellowship.”

In April **Herb Anderson’s** widow, Alice, went from Philadelphia on a long trip to the Orient. While in Taipei, Taiwan, at my suggestion she called Gilbert Mar, ’51, son of our deceased classmate, Admiral **Pellian T. Mar**. Alice wrote: “I called Mr. Mar and he was most cordial. He and his wife took me to dinner at an American Officers’ Club and then sightseeing, including the famous National Museum. They were charming.” From there she went back to Japan and wrote me again from Hawaii. She was with the American Association of University Women. It’s good to hear from Alice and we’re glad a son of 1915 could be good to a widow of 1915. . . . **H. Nelson Slater** died April 22 in Vevey, Switzerland, where he had lived for some time.

Although he was never active in class or alumni affairs, he will be remembered for his unusual and generous gift to the Second Century Fund. . . . **Bill Brackett** has semi-retired to a new house in Duxbury, Mass., where he joins Larry Bailey and **Ray Delano** who live there.

On yellowing old style linen finished paper, with the small red M.I.T. seal at the top, **Maurice Brandt** wrote: “After thinking of you many times, I finally write. Thanks for the 50th Reunion picture and class news. Your class notes are really wonderful! Just previous to our 50th Reunion I had returned from a very tiring business trip and knew I was too exhausted to make the trip. Very sorry to have missed it. By watching myself I keep in good health. Do you remember this stationery? A few sheets recently came to light—I bought it at Andy MacLaglin’s in October, 1911, when we were all very verdant! I was almost able to make the New York meeting this year—I have to be there in early May but could not change it to April—Sorry.

“I’m sending a score and program of Tech Show 1915—you might well add it to the Class Archives—of which our Secretary Supreme is the rightful guardian and archivist! You and Fran will enjoy playing and singing those nostalgic songs of yore. I’ll sure be at our Reunion in 1970—you may sign me up now. With the very best wishes.”

That 1915 Tech Show was “Take A Chance.” This two act musical comedy was written by Irving McDaniel, 1916. Some of the lyrics were by Frank Leslie, Ken King and Ed Kingsbury and some of the music by Frank Scully. Jack Dalton was on the Advisory Committee. Carl Dunn, Ben Rivers, Lou Miller, Charley Fry, Sig Helseth, Steve Holmes and Frank Gove were in the all student orchestra. Fritz Staub was the leading lady “Honoree” and did a dance specialty with Herb Williamson, 1916, and Don Tarpley, 1917. Ludwig Benston, Speed Swift, Gerry Coldwell, Wink Howlett, and Bill McEwen were in the chorus. Wallace Thomas, Alfie Nye, and Ercell Teeson are proudly wearing a T in the track team picture. Les Fletcher was Captain of the Hockey Team. Stalwarts in the wrestling team picture were Les Morse (Manager), Chauncy Durkee, Brute Crowell, Charlie Blodgett and Gabby Goodell. The plain, black, block letter printing and the current styles in the ads are certainly old and odd looking. But the prize picture, typical of those times, is the quarter page ad of The Technology Transfer Company, showing a man pushing a loaded wheel-barrow in 1901, then three horse drawing express wagons with their high wheels and then the progress to 1912 shows a motor truck the old half round radiator, acetylene lamps, brass horn and a driver sitting way up high under an open cover. Ah me, those were the days when we were young and gay!

In May **Clive Lacy** had cataract surgery in both eyes and after a long slow recovery is now doing all right. We all wish him the best. . . . Altho' **Henry Leeb** could not make the New York dinner, he asked us to phone him, so we had a chance to talk with him at home from the Chemists' Club. . . . We missed **Joe Livermore** but were glad to have his letter. "It would happen! I won't be able to attend the April 26 dinner at The Chemists' Club as Marjory and I have had a long standing date to entertain my brothers and family on that weekend. I'm still active in the engineering field, having just completed a three year term supervising the construction and equipping of a twelve million dollar newspaper plant in Newark. In January we went down to our usual holiday retreat on the north coast of Jamaica. Locally I'm a member of the Planning Board which I find very interesting and worthwhile. My oldest grandson, Tom Reid, will be a senior at Yale next fall and looks forward to graduate studies and a doctorate, possibly at M.I.T. My daughter and family live in Cambridge and the next time we're up that way I'll ring you up. So, with best wishes to you and all 1915'ers." Oddly enough, the brother he was entertaining is a neighbor of **Archie Morrison**. . . . At the inauguration of E. K. Fretwell, Jr., as President of the State University of New York College at Buffalo, on May 10, **Ben Neal** represented M.I.T., properly gowned in academic regalia. Unfortunately, Ben couldn't be with us in New York. He was suddenly called to Florida, where his daughter Barbara, had been in an automobile accident. We all do hope everything is better for them now. . . . At this writing, May 10, we are all looking forward to our annual Class Cocktail Party and dinner at the M.I.T. Faculty Club on the afternoon of Alumni Day. A full report will be in the October/November *Review*.

From Washington, **May Plummer Rice** wrote her cousin, **Al Sampson**: "Three exciting weeks at Colonial Dames of the Nineteenth Century, D.A.R., and Huguenot National Society Convention in Washington. As a delegate it kept me so busy I did not advance anywhere genealogical-wise. My freighter, Montreal to England, has been advanced nine days, so I'll have to wait until my return to accept your dinner invitation." Their family relationship stems from their old Mayflower ancestry. Mary surely keeps busy and deserves credit for so many interests and activities. . . . We missed **Bill Spencer** in New York. He wrote: "Sorry I must miss coming to New York to have dinner with you. But an influx of grandchildren to visit us over that weekend has tied me up. Sincere regards to all and I'll be thinking of you. Will write more later." . . . Pathetic and sad **Jim Tobey**: "We got home from Florida on April 9 and are suffering in the New England climate. It was 89° when we left and 55° when we arrived here. Woe is me!" What a life for him. . . . Aboard the stern-

whaler *The Delta Queen* in New Orleans, good **Bob Welles** wrote: "My daughter and I have just finished a cruise down the Ohio and Mississippi Rivers in this old vessel that started life as a Sacramento River boat. We've just had dinner at Arnaud's and tomorrow we'll fly back to Pasadena." It's good to hear from Bob away down yonder. And we envy him that dinner.

Herb Whitcomb has been laid up for some time. His wife, Marion, wrote: "It was most thoughtful of you to send Herb a greeting card after your last dinner. He thoroughly enjoyed it. **Whit Brown** came to visit and told him all the news. As you probably know, he now has Parkinson's Disease along with the heart condition so gets out very little. I, also, should like to express my appreciation for your kind remembrance to Herb. May you all have a delightful time at the dinner." We all join in sending Herb our sincere and friendly wishes for a speedy recovery. . . . The April 10 issue of the Keene, N.H., *Sentinel* carried this piece about **Pop Wood's** work for the Civil Defense Unit in Peterboro, N. H. Congratulations to Pop for his civic interest. "Peterborough—Civil Defense Director Carl Wood has announced a meeting of the area civil defense personnel will be held April 16 at 7:30 p.m. C.D. headquarters in the Historical Society Building. Object of the meeting is to acquaint the Peterborough Civil Defense Forces with the newly installed radio system now in operation. Transmission is made from Pack Monadnock Mountain. Peterborough now qualifies as one of the most advanced C.D. units in the state based on the size of the town and Carl Wood, the Director, has been cited by state authorities for his development of the unit."

The *Review* Editor wrote a fine apology to Mrs. Hooper in Portland, Maine, for the unfortunate error the *Review* made in misspelling Don's name in our April notes. Our thanks to him. . . . As the dedicated Secretary of the 1918 Class, F. Alexander Magoun writes an excellent column of notes, much deeper and more philosophical than most of the rest of us do. He uses a particular line, "There is something special about college classmates." In view of the unusually close friendship, fellowship and camaraderie in our Class, I asked him to amplify or explain this line, since he has such a mastery of words. I call your attention to his answer—the opening part of his June, 1918, notes. Thank you, Maggie, for your interest in helping me better to understand this bond and feeling we have one for the other classmate.

Another lively, enjoyable and stimulating Class Dinner opened at the M.I.T. Faculty Club, with the old Pirate, with his skull and crossbones, leading a "we are happy" cheer. The 23 classmates and guests present were a splendid tribute to our fine Class Spirit. Our younger members, now really a part of

the Class were out in force: Gene and Herbert Eisenberg (1943 and 1952), David Hamburg, Jim Hoey (President, 1943), Gerry Rooney, Bill Sheils and his son Paul, and Jack Sheils. Paul is Henry's grandson. This is the first time we've had a third generation at a Class dinner and we were very proud to welcome this boy, a freshman at Merrimack College, Andover, Mass., and we hope he will be with us often—a splendid addition to our crowd. Come again, Paul. But for the unfortunate last minute cancellations from Wayne Bradley, Horatio Lamson, Larry Landers and Harry Murphy, with the 23 present, we should have had a record attendance. Larry Bailey, South Duxbury; Whit Brown, Concord, Mass.; Jack Dalton and Pop Wood, Peterboro, N.H.; Archie Morrison and Fred Waters, Marblehead; Stan Osborn, Hartford; Max Woythaler, Framingham; Charlie Norton walked on the waters from Martha's Vineyard; Frank Murphy, Jac Sindler, The Pirate, Wally Pike, Bill Smith and Azel Mack staggered in from nearby. We advertise "no speeches" but we always do like a word from the fellows who have been doing things—**Stan Osborn**—well, nobody really knows that he does; Max spoke of his trip to the M.I.T. Fiesta in Mexico City where he and Katherine were awarded a sterling Eager Beaver as regular attendants. **Whit Brown** told of Florida M.I.T. meetings at Orlando and another on the West Coast. He prefers our 1915 parties. A showing of hands indicated that everyone present was enthusiastic about having a 55th Reunion in June, 1970. So be it! Jack closed the evening with a touching talk on the fine and friendly Class Spirit in 1915 and the pleasure and distinction of having young Paul Sheils with us. Long may we wave! So, remember our coming 55th Reunion in June, 1970, and plan for it. Here endeth our column for this year, with friendly wishes for you all and your families to enjoy a healthy and happy summer with my profound thanks for all you've done to "help Azel."—**Azel W. Mack**, Class Secretary, 100 Memorial Drive, Cambridge, Mass. 02142

16

"It is change, but is it progress?" Think about that a little bit for it is amazing how widely it applies. And why do we bring it up? It is something that **Herb Mendelson** uttered so slowly and so wisely during our 50th Reunion weekend two years ago, about something that came to our collective attention, maybe modern art, maybe something else. But how often it comes back, and how applicable to so many things. It appears to be one of those sage sayings that comes from individuals whose reunions number in the 50's, who now have time to think and who have picked up a wonderful collection common sense. If you find it is answering some of your problems, let us know and we'll give full credit to our own Herb Mendelson.

Now that our 52d Reunion at Chatham Bars Inn and all the plans worked out by our ever-going President **Ralph Fletcher** and our honorary member **Bob O'Brien** are history, we have the summer months to enjoy and the 53d to look forward to. A report of the doings of the 52d will be included in the October/November issue of the *Review*. As we write, it is anticipated that there will be 35 to 40 at the 52d, about the usual number for an interim reunion. A considerable number can't make it for travel reasons, including **Rudi Gruber** (in Germany), **Gordon Fair**, **Ed Hall** (in Killarney), and the **Walt Bingers**, the **Merrick Monroes** and the **Wes Blanks** (in Europe). From **Ralph** we have a colored photo, with an arrow showing just where **Rudi Gruber** will be on June 8 in Lindau, Bodensee, at a Gruber Family Reunion at Bad Schachen. No doubt some of our travelers will bring back a few little gems of observation or tasty kernels of old-world philosophy for inclusion in our monthly column. . . . Our report in April credited **George Hale** with the arrival of his "first grandchild." Important correction: this was really a much more significant event, for **Jennifer Marie Nowland** is in fact his first great-grandchild, "and thus the first of the fourth generation and daughter of my oldest grandson." This is the first '16 great-grandchild we have heard about and now we sort of wonder if there are more. . . . We have a number of clippings, one indicating that **Charles Wareham** is now Emeritus Associate Professor and lives in Marblehead, and a second, that **Stephen Simpson** is retired from M.I.T. and lives in Auburn-dale. We also have word that **James Murdough** has retired as Professor Emeritus of Civil Engineering, Texas Technological College, after 37 years of service, 35 as Head of the Department of Civil Engineering.

In the March issue we mentioned we were going to ask **Allen Pettee** of Tryon, N.C., for an example of multiplication by the Mayan numerical system, the vigesimal system, which has intrigued him. And we hoped for an example for the column. Well, we have a reply, and an example prepared in both a "long form" and a "short form," with different degrees of understandableness. Let us start out with what **Allen** submitted and see how far we get: "The Mayans, in their vigesimal system, used only three digits (including zero) instead of our 10 digits; a dot for one unit, a dash for five units, and a shell for zero. While we successively multiply by 10 as we work leftward from the units position, the Mayans worked upward from the first unit, multiplying successive units by 20. Thus on the base level a dot is one and a dash is five; on the second level a dot is 20 and a dash is 100; on the third level, a dot is 400 and a dash is 2000, etc. The Mayans did a 'snow' job, making use of all fingers and toes, instead of just the fingers. When the accumulation of dots and/or dashes on any

level reaches the equivalent of 20 dots, this sum is carried up to the next level as a single dot. Conversion from dots to dashes is made where possible, to simplify and presumably to make it possible to grasp the value of any number conveniently and quickly. Traders and astronomers (the priests) who needed the numerical system doubtless became quite proficient in fast recognition of dot and dash combinations for the numbers up to 19. Thus their number for 19 ($\cdot \cdot \cdot \cdot \cdot$), with three five's and four one's could, I believe, be recognized more readily than 19 dots." The use of a dash to represent five is interesting—we understand crows can recognize numbers up to five but become confused with numbers over five. We are told that if five individuals leave food in a clearing in the woods, and three or four leave, the crow will wait; but if five leave, he will go for the food at once. The same for four, three and two individuals. As for his example of multiplication, **Allen** says he is not sure the Mayans multiplied, but if they did he offers a reasonable method. But we'll not give the example here unless we are overwhelmed with demands from our readers.

Dick Hunneman of Woburn says he keeps busy "tending investments, maintaining three properties, two cars and two small boats, racing sail boats, paying taxes and getting disgusted with things generally. I deplore the moral decay caused by the dishonesty of inflation. The gold standard is condemned because it is too respectable and governments don't like that. They prefer a standard of chicanery. My two Harvard sons are experienced ocean racers. My Tech son-in-law is a space scientist with Jet Propulsion Lab in Pasadena. Wish they would reinstate the Stein Song on Alumni Day night, either that or (listen, **Barney Gordon**; Sec.) "Old Man River!" . . . **Francis Stern** tells of a fine April weekend at the fishing club, the one, we presume, that he has had an interest in for these many years. The weather was apparently better than the fishing but he did pick up five nice trout. He notes: "Saw **Dick Fellows** at an ice cream place in Palm Springs just before I left. Gladys spotted his red Class blazer. He won't be at the Reunion—goes east in May but can't stay long enough to be at the Cape." . . . **Maury Holland** is always doing something off the record and that seems to be what he is doing now (in May) out of Miami. Once in the past, it was related to communication with dolphins, but now it is more in the nature of ocean systems operations, if we interpret correctly what little we have.

After practicing architecture in his own name in Cincinnati for 47 years, **Charlie Cellarius** retired this spring. He says: "My partner, who has been a partner in my office for 10 years, under the name of Cellarius and Hilmer, will continue the firm. I come down to the office two or three times a week but have

ceased to be of any real value. I never had any children and my wife died four years ago, but my stepdaughter, who has a secretarial position in the Chamber of Commerce here, takes care of my home. In February I had a couple of weeks in Florida and two-week cruise in the Caribbean on the *Leonardo da Vinci*. I hope to get another trip to Europe this summer. I spend a day every week with my yard man and the other days wandering around the garden admiring the flowers. Haven't had time to realize that I am retired."

Elbridge Devine of Pelham, N.Y., says the '16 column "is the best part of the *Review*—I go for it first." Also says he is only about 75 per cent retired, stays pretty much in Westchester County "where we have most everything" and "to keep up with the town gossip I fill in a few hours some nights in a local store. Enjoy seeing the old folks I have not seen for years." He notes that while he and **Beulah** can't compete with the **Paul Duffs**, they do have 13 grandchildren and spend many happy hours with them. "We can enjoy seeing them progress more than we did with our own. All I can say is that to enjoy life you must have a cheerful outlook on life in general. Our days are getting short so we try to enjoy life to the fullest." . . . Are you the exploring type? Are you interested in far-off places? Do you live in New Jersey? If all three answers are Yes, you should drop in for a visit with **Harold Mills** of Mountain Lakes, look up into the sky through his reflecting telescope, the one equipped with the eight-inch mirror that took him seven months to complete. Only recently we had the pleasure of seeing four of Jupiter's moons through his telescope right from the edge of his front porch. Should you want or need more detailed information about the surface of the moon, here is one place you can get it in good company.

Irv McDaniel asks whether we have ever visited the Naval Academy Museum. He says if not, but if we plan to, we may be interested in some of its past history. And I guess that goes for any '16er. He writes: "In 1938, the present museum was very new and very partially filled. And in order to get some action they placed my old friend and skipper (U.S.S. *Melville*) Captain **Harry Baldrige**, U.S.N.(ret.) in charge. I was then stationed at the Naval Gun Factory in Washington in charge of moving the Model Basin to Carderock, Md. We had a very old building without any floors, about 50 feet high, which had been a waste basket for over 100 years. When I started to clean it up, I found among the debris the original steering wheel of the frigate U.S.S. *Constitution*. It was a major discovery and I sent it on to the Naval Academy Museum. From then on I proceeded with the most modern techniques for archaeological research—we even used spoons and tooth brushes for our excavation work. The Seven Cities of Troy could not compare with the

American historical and naval relics we found. The Navy Department has always kept the most minute records from the time of John Paul Jones but we found models of old ironclads that were built, swamped or lost at sea that the Navy Department had no record of. We found the first cannon cast in the Gun Factory (1807 A.D.). We found hand and leg irons used by the British when they captured and burned Washington. I filled the Annapolis Museum to overflowing and that is when we started the Museum at the Gun Factory (also well worth a visit as they have reclaimed many items I sent to Annapolis). We found several Duncan Phyfe originals. So many in fact that we hired a curator who was a specialist on early American furniture. He was the one who told me that our two wing back chairs that Admiral Farragut brought around the Horn to Mare Island in 1849 when he founded the Mare Island Navy Yard, were Duncan Phyfe originals. The Naval Academy Museum has progressed until today it is really a great museum. Most of the relics I furnished have been re-buried in the basement and replaced in the older, more spectacular loan exhibits depicting the Royal Navy."

The joint monthly 1916-17 luncheons at the Chemists' Club, 52 East 41 Street, New York City, have carried on nicely through the past year and will start up again this fall. The May 5 luncheon had seven in attendance: Walt Binger, Rudi Gruber, Herb Mendelson, Francis Stern and Peb Stone of 1916, and Bill Hunter and Dix Proctor of 1917. Rudi was close to departure for Germany on the S.S. *Bremen*. **Walt Binger** had some exciting things to say about his consulting trip to Iran relating to the development of the country, and during which he had personal contact with the Shah. **Francis Stern**, not long back from Palm Springs, was fêted and toasted for the day of the luncheon was indeed his 75th birthday. **Dix Proctor** had much to tell about his longest trip ever—a five-month freighter voyage around the world. And **Bill Hunter** was able to make preliminary comparisons of life in rural (Farmington) Connecticut with that as an old timer in suburban New Jersey.

Some of our classmates knew and may recall that in 1955 Walt Binger was the Consultant on Public Works to "Sazmani Barnameh," or Plan Organization, of the Government of Iran. This group had the spending of about \$80 million a year of oil royalties on public works (dams, highways, port development, etc.) and industrial expansion primarily in the textile, sugar and cement industries. They were looking for "someone who had had experience in large public works in which their engineers, while as well educated as we are, were very deficient." Says Walt: "They knew I had been in charge of the East River Drive. I spent four months in Iran at that time—actually wrote the clauses on engineering and construction contracts, showed them the proper

way to take bids from all over the world and negotiated contracts with successive bidders involving hundreds of millions of dollars. My employer, the Persian government, had sent me from the nomadic settlements of the Russian border down to the Persian Gulf (Beatrice always along) but I had never seen any of these works completed." When Walt returned to New York a group of scholars of Persian archaeology, including curators of the principal museums in this region, as well as wealthy and ordinary collectors of antique rugs and works of Persian art, asked him to show his colored slides which were at that time not very common.

The name of this group is the Hajji Baba Club and they invited Beatrice and Walt to become members. Walt adds: "Through this connection I became a Trustee of the Fourth International Congress of Art and Archaeology (of which I knew nothing) which was held in New York in 1960 under the joint presidency of the Shah of Iran and President Eisenhower. It is a fact that the scholars of great nations—Japan, India and Russia and all of Europe and the United States—believe that the origin of much of their architecture and art is Persian."

Now for the present. The Persian Government decided to hold the Fifth International Congress in Iran itself and Walt was urged to go over there by the American President of Pahlavi University at Shiraz in that city in southern Iran. This April Walt spent a fortnight in Tehran, Isfahan and Shiraz seeing the great antiquities, some of which, including Persepolis, they had visited before. Walt says he had four reasons for going. "First, to see and hear some of the pictures and lectures on Persian archaeology given by 180 scholars of more than 15 nations who were assembled. Through connections I mentioned above there were present a number of our good friends—American scholars and a Persian Professor at Columbia. The second was to visit more antiquities under such wonderful auspices. But the most pleasant was to see again the good Persian friends with whom I had worked and kept in touch, this being my fourth visit (one for an American mining company).

Last and most important, to see the Karaj Dam, which gives the first water supply to the city of Tehran, one of the two dam contracts I had written. (When we kept house over there the water supply ran in 'jubes', cement gutters along the avenues and streets.) I had not taken Beatrice on this trip because there would be very few women and because the pace was really stiff, including almost daily receptions by the Prime Minister, the American Ambassador and many others. My Persian friends, all of whom speak fluent English, treated me royally, gave big dinner parties while I gave a luncheon for them. It was in every way a successful and rewarding trip."

We are very sorry to report the passing of **George Tuttle** of Suncook, N.H., on March 3. He had suffered from a paralyzing stroke late in 1966 and had been unable to attend recent reunions. . . . Finally, the best wishes of your officers for a happy, healthful and restful summer and just the kind of vacation you have been looking for. Let us know where you are, wherever you are, and what you are doing, whatever you're doing. Just write a little but write often to your ever-interested secretaries.—**Harold F. Dodge**, Secretary, 96 Briarcliff Road, Mountain Lakes, N.J. 07046; **Leonard Stone**, Assistant Secretary, 34-16 85th Street, Jackson Heights, N.Y. 11372

17

Our 51st Reunion will be on October 9 and 10 at Sturbridge, Mass. The Public House and the Treadway House have reservations for us. The "Colonial Village" at Sturbridge has had additions since our last visit there and fall foliage should be at its height. You will be receiving detailed information from **Dud Bell**, but meanwhile mark your calendar now and plan to be there. . . . You will recall from the May and June notes that classmate **P. Y. Hu** has a grandson who is a freshman at M.I.T. We had lunch with him, Chi Kuan Wu, and found him to be a fine young man. Although he had studied English he had never spoken it until last fall and it is simply amazing to realize that our conversation was in no way difficult. To think also of his having to study in English, texts and lectures, it is all the more impressive. His faculty adviser says that Chi Kuan's marks are good. He lives in Burton House with an American roommate and exchanges instruction in Chinese history for instruction in English. He also plays soccer. Summer work for foreign students is often difficult to obtain. He has applied for dining room service in the Student Center and also for work in the Institute Maintenance Department. Meanwhile, we hope we can find work for him.

Dick Whitney and Ruth report that the 20th Annual M.I.T. Mexican Fiesta in March was great. The program was similar to those of previous years, starting with lunch at the University Club. An innovation was the spectacle of the "Sound and Light" at the Pyramids by the light of a full moon. There were the usual tours of the city and places of interest in the area. The climax was the *Noche Mexicana* in the garden of the Cornish Home with Luisa and Nish ('24) as hosts. In addition to the wonderful Mexican food were the traditional Beaver Pinata, Mexican costumes, many bands and singers and Mexican dancers. Classmates also present were Conchita Lobdell Pearson and Eagerissimo Beavers Ruth and **Bill Denen**. . . . By the time this is read, the memorial gift of the 9' x 7½' Rogers Building painting by **Nelson Chase**

will have been unveiled. Beside the fine presentation of the building, the border is of special interest being reproductions, in part, of those old murals in Huntington Hall. **Leon Keach** is writing an historical sketch of William Barton Rogers and the Rogers Building which is to be available as an accompaniment with the painting. . . . In 1924 **Jim Flaherty** entered a painting of the entrance to the President's house in the Summer Sketches Contest of the Boston Architects Club and won first prize. This was reproduced in *Technique*, 1925. Recently he made a large water color of the painting and in May, at a small dinner gathering, he presented it to Betty and Howard Johnson. . . . **Dix Proctor** and Vi arrived home on May 1 from their 35,874 mile cargo-ship cruise. They are digging through five months mail. Lydia Mahaffey has also been traveling the far East. . . . **Loosh Hill** was reminded that probably his future is behind him when he was made an Honorary Trustee of a bank without pay. . . . **Walt Whitman** finds retirement in Scottsdale, Ariz., even more fun than working for he did not garden or play golf during his first 70 years. . . . In connection with the Alumni Fund it is gratifying to have personal notes. Often this done by writing on the flap of the Fund envelope which is then forwarded to the Secretary. Recently there have been several such messages. **Tharratt Best** was elected a Minute Man after 40 years in the Army and Air Force Reserve. He was honored locally in a "This is Your Life" broadcast. He organized a big centennial celebration for the First National Bank of Boonville (N.Y.), of which he had been President and Chairman for 40 years, and completed the 30th tax map of the village. . . . **Bill Eaton** enjoys his retirement in California. (It is interesting to note that although he owes allegiance to Colgate he has contributed regularly to the Fund for 19 years.) . . . **Clair Turner** has always been appreciative of the cordial hospitality extended by the men of '17 although his time with the Class was not long.

Alfred Pierce (he who was declared "deceased" in 1919) finds time to travel and keep busy too with volunteer work in civic organizations. . . . **Barney Dodge** returned from teaching at the University of New South Wales, Sydney, Australia. . . . **Les Groves** and Grace Groves had a month's trip to England, Scotland and Ireland. . . . **John Parsons** has retired from Calkin and Bayley, Inc., of Rye, N.H. . . . **Luther Lauer** has retired from Allied Chemical Corporation. . . . Colonel **John Platt** has a new address, 15113 Saticoy Street, Van Nuys, Calif. 91405. . . . **Charles Abels** is living at 60 Washington Park Drive, Andover, Mass. 01810. . . . Remember October 9th and 10th at Sturbridge and make your plans now to be there.—**C. Dix Proctor**, Secretary, P. O. Box 336, Lincoln Park, N.J. 07035; **Stanley C. Dunning**, Assistant Secretary, 6 Jason Street, Arlington, Mass. 02174

18

By the time you read this our 50th Reunion will be history, yet it does not seem a whole half century ago that we were thinking more of war than of graduation. Many of us were not even in Cambridge for the event. The progress of mankind seems slow when measured by a single lifetime. However, we have at least lived reasonably with Mexico since General Pershing made an army conditioning expedition out of chasing Poncho Villa. One result was this year's twentieth annual Fiesta, held last March by the M.I.T. Club of Mexico City. Nineteen eighteen was represented by **Max Seltzer** and Selma, who were on vacation from 87 Ivy Street, Brookline. . . . A cousin of mine, wintering in Florida, called on **Albert Sawyer** (275 Riverside Drive, Ormond Beach) and found warm, hospitable people who were looking forward to being with us come June. Albert's present project is growing papaya trees. While showing off his garden, a pet cardinal—bird please, not an ecclesiastical prince—followed him around, to their mutual pleasure. . . . A short note from **Sumner Wiley** (4709 Drummond Avenue, Chevy Chase, Md.) speaks of the anticipation with which he and Winifred were looking forward to Reunion and of regret that such classmates as **Ken Reid** and **Irving Hall** are beyond all reunions.

Unable to attend this Reunion, **John Abrams** (812 South Barlow Lane, Bishop, Calif. 93514) takes the time to "record a few earth shaking items proving that I am still going strong. After 47 years, I'm an academic maverick in the wide open Far West. With my first science baccalaureate in 1916 from the ancient and hallowed halls of Washington and Jefferson College, I took off in the fall to enter Tech as a sophomore. But I wasn't to get my next degree until four years later with the Class of 1920. When war was declared in April 1917 I got the blessing of Dr. Henry P. Talbot for Army enlistment. So ended my actual membership with our illustrious Class, perpetuated in October, 1919, as the 'Post War Class of 1918.' My fealties have been mixed: 1916 at Washington and Jefferson College, 1920 with my S.B. and finally 1921 at Tech with my S.M. in X-A. I know such great characters as Atwood 'Brick' Dunham and Sam Chamberlain (we lived on St. Botolph Street), Sax Fletcher, Packey McFarland and Ken Akers. There was Dave Patten whom I bumped into at the Hotel de Louvre in Paris after the Armistice. I took Dave and two patriotic Red Cross nurses on a memorable but short lived grand tour in my general's Cadillac, entrusted to me for a mission as his Assistant G-3 from the Burgundy H.Q. of the First Army Corps to Paris. Chauffeur-driven, snugly fitted into the back seat, we sailed up the Champs Elysees boldly displaying the insignia of a two-star general officer. Hardly had we passed

the Arc de Triomphe when, of all persons, our driver spotted the approaching limousine of General John J. Pershing, the U.S. Commander in Chief. Square-jawed, he returned our shaky salutes never guessing his fellow officers were a couple of lousy lieutenants. We sneaked back to the American Garages to do Paris under the aegis of a knowledgeable taxi driver. Had we been caught, we'd have been court-martialed and returned to the States. Those years at M.I.T. a half century ago, were halcyon days. I still recall how **Sam Chamberlain** and **Don Parkinson** had me put on a skit at a Course IV banquet. Depicting a bumbling, moustached professor with button shoes and gravy on his vest, I was billed as a riot. In retrospect, I realize that I was really pretty awful.

"After completing my graduate work in the new School of Chemical Engineering Practice, I went west on the advice of great teachers, Drs. Warren K. Lewis and William H. Walker. In Los Angeles I had a lasting friendship with Dr. Walker when he had retired as the first head of what was frequently called The Technology Plan. I got a job in the oil fields at a time when engineers and geologists were anathema to the practical oil men. In the early 1920's I designed, built and operated one of the first natural gasoline plants in famous Signal Hill, and later, the first oil topping plant in Arizona. The love of adventure led me into the drilling and producing oil business as a small, independent operator. Down through the years, exploratory work and feasibility studies in diverse phases of natural resource development, such as bituminous oil sand, sulfur and other non-metallics, have carried me into remote desert and mountain areas of the west. A trout rod has always been close at hand. Perhaps the biggest undertaking was a pioneer investigation of the economics of electric power development from a newly discovered geothermal stream reservoir near the Salton Sea in Southern California. Forty years out of Technology, and never a whizz in thermodynamics, it turned out to be a successful but gruelling exercise in boning up on and then applying Walker, Lewis and McAdams on principles of chemical engineering, and McAdams on heat transmission. Now, 10 years later, the area is witnessing initial work on a multimillion dollar investment by two companies in steam-electric power generation and brine processing from mile deep wells, capable of producing 600,000 pounds of salt laden fluid per hour. Thus, in the late 1960's I've come, full circle, back into the realms of pure and applied science where I started. Three years ago my wife and I moved out of the teaming, smog-ridden megalopolis of Los Angeles into a new traditional home on a trout stream near Bishop in the Eastern High Sierras. Blessed with three fine children, I can look out upon the snowcapped 1400 foot crest with my four grandchildren and salute my schoolmates and contemporaries with General

McArthur's Credo, spoken on his 75th birthday at Los Angeles: "Whatever your years, there is in every being's heart/The love of wonder, the undaunted challenge of events,/ The unfailing, childlike appetite for what next. . . /You are as young as your faith, as old as your doubt./As young as your hope, as old as your despair. . . / So endeth this proliferation of happy memories from which our 1918 scribe may glean tidbits for far-off friends. Ever sincerely an avid reader of the 1918 Class Notes, I send you all, good wishes!" So, despite his multiple class associations, John gives us an inspiring dedication to our 50 years as college graduates. Let us all have an unfailing appetite for, "What next?"—**F. Alexander Magoun**, Secretary, Jeffrey, N.H. 03452

19

A note from **Packey MacFarland** says that he spent some time in Florida at Ft. Myers this winter. He and his wife stopped in Williamsburg on their way south to attend the Antiques Fair. One of his daughters is living in New Canaan, Conn., and the other daughter lives in Baltimore. Her husband is a Johns Hopkins doctor. Packy says he is a one-acre frustrated farmer. . . . We regret to report the death of **Jacob Lichter** on February 7, 1968. He was a Trustee of Hebrew Union College Jewish Institute of Religion. He supervised construction of its college in Israel where he and Mrs. Lichter had traveled a great deal. He held honorary doctor degrees from the Universities of Cincinnati, Akron and Ohio Wesleyan. . . . **George Michelson** writes that he is still active and busy in both business and communal affairs. His three children are married and live in Massachusetts. He has eight grandchildren. He and his wife made a trip to Rome this winter. . . . **Kingman Winkfield** and his wife have been in Switzerland, driving through the Alps. . . . **Fred Barney** retired from active business in 1948 because of ill health. He lives in Hendersonville, N.C. . . . **Otto Muller** is recovering from a stomach operation. He is now a consulting architect, having retired as President of Halsey-McCormack and Helmer, Inc. . . . **Capt. Lewis Atwood** of Newburyport, Mass., died November 3, 1967. . . . Your Secretary attended the student alumni seminars April 19 and 20, and ran into our classmate **Edgar Seifert**. He wanted to be remembered to all in the Class.

When you read these notes, it will be just about a year before our 50th Reunion. **Will Langille**, our Reunion Chairman, **Don Way** and your Secretary had a meeting at Wachung View Inn near Somerville, N.J., on April 26 and plans for Reunion were discussed. The Class had a dinner at Roger Smith Hotel on May 21 and all the standbys from the New York area were present. Here again the 50th reigned supreme in the discussions. The schedule for our Reunion

as given to me by Will Langille is: Thursday, June 12, we arrive at McCormack Hall, have an informal reception and a buffet dinner; Friday, June 13, we attend commencement exercises (academic regalia furnished by alumni) and seats will be reserved for our wives, luncheon in the Great Court at noon, dinner at the Chatham Bars Inn at 7:30 p.m.; Saturday, June 14, we are at Chatham Bars Inn all day; Sunday, June 15, we leave Chatham Bars Inn about 12:30 and attend reception at the home of President Johnson at 5:30 p.m.; Monday, June 16, we have a free morning, lunch in DuPont Court and presentation of Class Gift, dinner at 8:00 p.m. Rockwell Cage. If you haven't sent your "yes, I'll be there" to Will, do so at once.—**Eugene R. Smoley**, Secretary, 30 School Lane, Scarsdale, N.Y. 10583

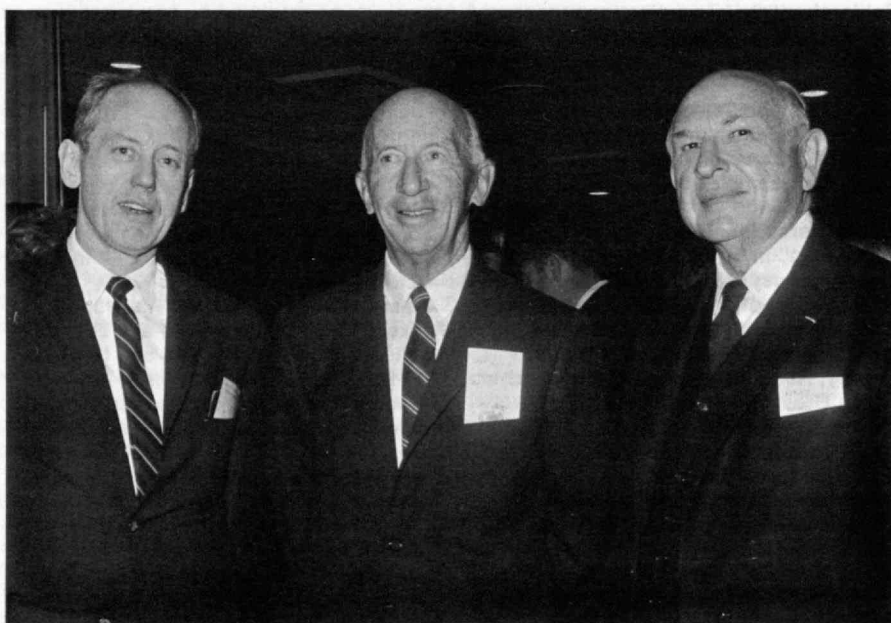
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Norrie Abbott reports an exceedingly pleasant visit to the Mexican Fiesta in March. Says Norrie: "Betty and I enjoyed it even more than the first time. It was a delightful and varied program. About 80 came down from the States but I was the sole representative from 1920. Nineteen twenty-one is planning a second group pilgrimage to next year's Fiesta and 1939 is stirring up similar interest. I would still recommend it for 1920." Having attended, I too can recommend this as a Class meeting place. If it strikes a responsive chord in your breast (sic!) as a rendezvous for next March a word to your Secretary or to Norrie (169 Brown Street, Providence, R.I.) will start something. . . . It was good to hear from **Bink Carleton**

of Clarksdale, Miss., even though indirectly. Bing sent me a copy of his letter to President Howard Johnson in which he sounded a spirited defense of the patriotic majority in this country. Says Bink: "This is a good country with magnificent ideals and intentions. Let us talk less of unearned social rights and more about social responsibilities and discipline. Let us talk up our great country. Nowhere else in the whole world do people, regardless of race, color or creed, have the opportunities and good living conditions that are available here to the responsible and industrious citizen."—**Harold Bugbee**, 21 Everell Road, Winchester, Mass. 01890

21

Again we come to the end of a volume of *Technology Review* and take leave of you for the summer. Be sure to rejoin us with the October/November issue next fall—via the Amity Fund route, of course—for the accounts of the participation of the Class of '21 at Alumni Day last month, at the September Alumni Officers' Conference, the Alumni Seminar and the news about yourself and your close associates in the Class, which we hope you'll be kind enough to send us during the summer so we'll be assured of news to print. . . . **Arthur E. Raymond** was honored as the lecturer on "Air Transport History and a Glimpse into the Future," the ninth annual Lester D. Gardner Lecture under the auspices of the M.I.T. Department of Aeronautics and Astronautics, held in Kresge Auditorium last May. He thus joins other aviation "greats"—Grover



Edwin S. Burdell, '20 (right), former Dean of Humanities at M.I.T., was among the guests at the 1968 Florida Festival in Orlando on January 27. There were all kinds of Cambridge reminiscences when he met Kenneth R. Wadleigh, '43 (left), Dean of Student Affairs at M.I.T., and B. Alden Thresher, '20, Emeritus Director of Admissions, during the Festival events.

Loening, Igor I. Sikorsky, James H. Doolittle, '24, among others—in the series made possible by the late Major Gardner, '98. Aviation has been Art's major interest for more than 50 years, beginning in 1915 with a flight in Roy Knabenshue's dirigible balloon while he was in grammar school. He received a master's degree in aeronautical engineering with us and began a 35-year association with Douglas Aircraft four years later, starting as a metal worker in the shop and advancing to the position of Chief Engineer in 1934. He was in charge of Douglas engineering until his retirement in 1960. He was particularly close to the development of transport aircraft, from the DC-1 through the DC-8 jet and he received many honors for his contributions to the design of the well-known DC-3. He was a member of the National Advisory Committee for Aeronautics from 1946 to 1956 and, for the past five years, has been a Special Consultant to Administrator James E. Webb of N.A.S.A. He is a past President and Honorary Fellow of the American Institute of Aeronautics and Astronautics, a member of the National Academy of Sciences and a founding member of the National Academy of Engineering. He gave the Wilbur Wright Memorial Lecture before the Royal Aeronautical Society in 1951. He was awarded the Spirit of St. Louis Medal in 1954 and the Guggenheim Medal in 1957. Art is currently a consultant and member of the Research Council of the Rand Corporation, a Trustee of Aerospace Corporation and of the Research Analysis Corporation. His lecture at Technology traced major milestones in the progress of air transport from its beginnings in the 1920's and gave a forecast of the direction future development will take into the 1980's. He emphasized that, while progress has been rapid and continuous to date, it can hardly be expected to go on indefinitely at the same rate. Nevertheless, an era of expansion lies ahead which will tax the ingenuity and capacity of society, considering not only the air vehicles themselves, but also the ancillary operations and facilities inherent in a complete system.

Roderick K. Eskew, for 27 years Head of Research in Chemical Engineering at the U.S. Department of Agriculture's Eastern Utilization Division, Wyndmoor, Pa., retired last August as Chief, Engineering and Development Laboratory, Agricultural Research Service. Rod is continuing his career as a consultant to government and industrial projects related to food processing. Among various research programs which Rod directed were the development of potato flakes, a dehydrated mashed potato product now made throughout the world; a vacuum process for making dry whole milk; fruit juice concentrates and powders which retain flavor through essence recovery; and the explosive puffing process for making dehydrated fruit and vegetable pieces which can be prepared for eating in minutes. Rod received the Babcock-Hart Award from



Arthur E. Raymond, '21



Roderick K. Eskew, '21

the Nutrition Foundation and the Institute of Food Technologists in 1966. Research and Development Associates of the U.S. Army Laboratories in Natick, Mass., gave the 1964 Rohland A. Isker Award to him for contributions to food science and technology which resulted in improved military rations. In 1959, he was a corecipient of the Food Technology Industrial Achievement Award for the development of potato flakes, also given by the Institute of Food Technologists. The Department of Agriculture gave its highest honor, the Distinguished Service Award, to a team he headed in 1950 for developing the essence recovery process. The application of this process to the recovery of essences from fruit preserves won the Department's Superior Service Award in 1955 and, in 1958, this award was given to Rod personally for his research leadership that stimulated the use of agricultural commodities. A native of Charleston, W. Va., he attended the University of Arizona and was graduated with us with both bachelor's and master's degrees in Courses X and X-A. He is the author of about 100 publications and patents dealing with new food products and processes, some of which are in wide industrial use. He has frequently addressed meetings of food scientists in the U.S., Canada, England and Germany on his research and engineering achievements. He is a member of the Institute of Food Technologists and St. Andrews Society. He is an avid horseman and devotes leisure time to genealogy, photography and the growing of roses. Rod has three children, Mrs. Richard Meyer of McLean, Va.; Bruce, Hampden-Sidney College; and John, at Germantown Academy. Milena and Rod live at "Roseburn," in the Pennsylvania countryside, and receive their mail at Box 205, Spring House, Pa. 19477.

Our sincere thanks to **Philip R. Payson** of Fort Myers, Fla., for sending the photograph of the four couples who represented the Class of '21 at the M.I.T. Florida Festival last January. The picture appeared in the June *Review*. . . . **Ray St. Laurent** sent us more published material on **John W. Barriger, 3d**, some of which he received from **Ed Dube**. We hope you are routing all your shipments via the Katy! . . . A brief note on his retirement activities, sent by Brig. Gen **Ludson D. Worsham**, U.S.A., retired, from his home at 1329 W. Muirlands Drive, La Jolla, Calif. 92037, says: "I have completely

retired and am enjoying golf, gardening and swimming." . . . An article in the Cape Cod *Standard Times* of Hyannis, Mass., relates that **George A. Chutter** of Boulder Drive, East Dennis, Mass., gave an address at St. Mary's Church, Barnstable, on the work of the Cape Cod Council of Churches. George is Chairman of the Stewardship and Finance Department of the Council and the Representative of the First Wesleyan Methodist Church of East Dennis. . . . Alex and **Munroe C. Hawes**, senior partner of Hawes and McAfee, Inc., real estate and insurance, 111 Union Avenue, Manasquan, N.J. 08736, took an extended spring tour of the south. In Pensacola, Fla., they visited their younger son, George, who is a Marine Corps pilot, and made various stops in Palm Beach, Miami Shores and Pompano. Munnie played golf with **Robert E. Waterman** and says Bob looks fine. The Hawes couple toured Mobile, Gulfport, Biloxi, Jackson, Vicksburg, Natchez and Knoxville with the Garden Clubs group before returning in mid-April. Alex and her sister then left for England and Ireland, with scheduled stops at the Chelsea and Bedford flower shows. . . . **Joseph Wenick**, 37 Cedars Road, Caldwell, N.J. 07006, has been most helpful with data and diagrams on art gallery lighting, drawn from his wealth of background as Chief Engineer of Lightolier, Inc., before his retirement. He writes, in part: "I have become involved in several civic matters and concluded that it is wise for me to drop some. Just think of it! At my age, I was asked, about four months ago, to run for the local governing body and the board of education." Among his other duties, Joe was re-elected for the *umpteenth* time as Treasurer of the M.I.T. Club of Northern New Jersey. He is Vice Chairman of the Municipal Library Study Commission of West Essex, a group of representatives from six towns which is studying the possibilities of a regional library to serve the entire area.

George Atkinson, 424 Adawood Drive, Copley, Ohio 44321, wrote a welcome letter saying: "Thank you for your note. I'm afraid I can't help you much in terms of news. Marion and I moved out of the city and have been enjoying the quiet of a small town since my retirement four years ago. Your Class News in the *Review* is always appreciated." For many years, George had been a member of the Research Staff of Pittsburgh Plate Glass Company, Barberton, Ohio. He and Marion are transplanted natives of Stoneham, Mass. They have a married daughter, Jane, who is a Wellesley graduate. . . . **H. duPont Baldwin** says he retired in 1962, when he sold his business, Personal Vending Service of Baltimore. He continues active in the Cruising Club of America and the Windjammers of the Chesapeake, of which he was a founding member. He is also a member of the Society of the Cincinnati and was on its standing committee for 20 years. Baldy has a daughter, Mary, a graduate of Vassar;

a son, Henry, a Princeton graduate; and two grandchildren. He lives at 187 Green Street, Annapolis, Md. 21401. . . . **Daniel P. Barnard, 4th**, P. O. Box 31 Bozman, Md. 21612, sent a much-appreciated letter in which he says: "Here's my effort at a quick reply. I retired June 30, 1958, as Research Coordinator for Research and Development, Standard Oil Company (Indiana) after more than 33 years with the company. We have done some traveling. Last winter, we went to Tahiti, Fiji, New Zealand, Australia, Tasmania (during the big February fire), Bangkok, and stops enroute, a total of 36,000 miles in 72 flying hours. My principal current activity concerns the Chesapeake Bay Maritime Museum at St. Michaels, Md., of which I have been Chairman since its inception in 1963. Come see it; it's worth while. Our daughter, Edith, is married to Fred S. Wood of the Research Department, American Oil Company, Chicago. Son Daniel, 5th, is in research and development with Sohio in Cleveland, Ohio. Eleanor and I are in good shape and have just purchased a new airplane—our fourth. Regards." Dan was, for five years, an instructor and member of the staff of the Research Laboratory of Applied Chemistry at Technology before joining Standard Oil. His distinguished work was recognized and he was signally honored in being elected National President of the Society of Automotive Engineers in 1952. Dan's memberships also include the Cosmos Club, Wings Club and the University Club of Chicago. He and Eleanor have three grandchildren.

Further to the article in the May '21 news, **Francis O. Holmes** is now completely retired and making his home on his farm, Craney Hill Road, Henniker, N.H. 03242. Frank is the author of two books, *Handbook of Phytopathogenic Viruses*, in 1939, and *The Filterable Viruses*, in 1948. He and Ruth have a married son, Francis, Oberlin and Cornell, and three grandchildren. . . . **Angelo O. Festicorazzi** of Course II, reports a change in address from New Orleans to 109 Ryan Avenue, Mobile, Ala. 36607. For many years branch manager in New Orleans, he is now on the headquarters staff of Streamline Pipe and Fittings Company. . . . Captain **Alfred H. Balsley**, U.S.N., retired, also Course II, makes his home at 4153 Sunridge Road, Pebble Beach, Calif. 93953. . . . Professor **Preston W. Smith**, retired from St. Lawrence University, gives his address as 104 8th Street, Scott Air Force Base, Ill. 62225. . . . **George Schnitzler** reports returning to 32 Gerry Road, Chestnut Hill, Mass. 02167, from his winter home in Florida. As you read this, he will likely have gone south again to 1932 N. Michigan Avenue, Miami Beach, Fla. 33139. . . . We are puzzled that Col. **Asher Z. Cohen** indicates a return from Florida to his former address, Apt. 1A, 3505 Langrehr Road, Baltimore, Md. 21207. Does this mean you have decided not to make

a permanent home in Florida, Asher? . . . Maxine and your Secretary welcomed Helen and **Ray St. Laurent** as our guests here in Brielle for several days on the first stop of their vacation trip and we toured the shore area. We visited Alex and **Munnie Hawes** at their home in nearby Sea Girt, N.J., and the three couples had dinner together on successive evenings. We listened to the latest tape recording from Maida and Ed Dube' and sent them one in reply. Helen and Ray spent some time in Harrisburg and Hershey, Pa., then went down the Skyline Drive and Richmond to the Outer Banks near Cape Hatteras in our old home state of North Carolina; next to Edenton, Williamsburg and the famous Tides Inn at Irvington, Va. Happily, they returned this way via Ray's brother George's shore home in Harvey Cedars, N.J., where we spent another delightful day together, with an exploratory trip to "Old Barney," the Barnegat Light. May brings many varieties of blossoms to our Brielle grounds and we wish others of the Class could also be here to enjoy the riot of color as this is written.

Ed Farrand phoned from his home in La Jolla, Calif., to say that his eyes are still not improving as fast as he had hoped and that he and Helen would not be able to attend on Alumni Day but he wanted to send their kind wishes to the '21 delegation. Ed has written a number of letters about Class Agent and Estate Secretary labors. The latest figures, as of April, show that his efforts and those of Ed Dube' raised the Class of '21 to fifth place among the 70 class units reporting, in the total dollar amount so far given to this year's Amity Fund. Both Eds are to be congratulated for their ceaseless hard work to achieve this remarkable status and you, dear reader, deserve most sincere thanks for your loyal help and generosity. Ed sent us a letter he received from **A. Ilsley Bradley**, which says, in part: "You are one of the few who calls me by my correct first name! I hope to get to the 50th Reunion. Will you be there? I have been in the real estate business for the last 35 years and am now buying land for the Cuyahoga County Engineer's Office for the widening of roads. I take it that you have retired, now that you gave up your farm in Georgia." Ilsley heads his own firm, A. I. Bradley and Company, 326 Bulkley Bldg., 1501 Euclid Avenue, Cleveland, Ohio 44115.

We greatly appreciate a long personal letter from **Arthur N. Brambach**, Hunters' Gate Farm, Route 2, Box 1870, Port Angeles, Wash. 98362. Art is most complimentary about '21 Class News and recalls some pleasant luncheon meetings we enjoyed together when he was in New York in 1948, preparing for a special I.B.M. assignment abroad. After we left Technology, Art spent 10 years in industrial engineering, first with Stone and Webster in California, then with Electric Bond and Share Company's Kansas subsidiary and later in the

Pacific Northwest with the Long Bell Lumber Company. In 1931, he embarked on sales and sales promotion with International Business Machines Corporation. From then until his retirement in 1964, he carried on a wide range of sales and sales executive responsibilities. Currently, home base for Naomi and Art is a newly constructed ranch type house of their own design, located on the Straits of Juan de Fuca, midway between Sequim and Port Angeles, Wash. Art reports that he and Naomi continue to be blessed with excellent health and there is never a dull day, what with the opportunities open to them for participation in the civic and social activities of the area. A former President of the Sales Executives Club of Seattle, Art is Vice President and Director of the Sequim-Dungeness Development Company and a consultant in sales and business administration. He is Chairman of the Clallam County Library System and active in Rotary when not otherwise engaged in fishing, sailing, skiing, hunting, or golfing. He and Naomi have a married daughter, Meg, a married son, Bob, and six grandchildren. To Art's cordial invitation to visit them and enjoy the surrounding natural beauty, we can sincerely say we'll make every effort if they will also plan to join the '21 gang at our 50th Reunion. Thanks, Art!

Waldo Adams sent a delightful letter from his home, 1765 Plymouth Street, Dubuque, Iowa 52001, saying, in part: "It has been so long since I addressed you. I retired as President of the First National Bank of Dubuque in 1966 and am now its Chairman. We are thoroughly enjoying the complete freedom to travel. We spend our winters at Cave Creek, Ariz. We took a European trip in the fall of 1966 and spent two months in the Northeast in the fall of 1967, including a week with Bunt Spalding, '22, at his Spalding Inn, Whitefield, N.H. As to the past, I worked for the family iron and steel business, the Adams Company, Dubuque, until 1930 and then started an industrial loan company, the Dubuque Thrift Plan, patterned after the Morris Plan. I operated this until 1954, when my associates and I purchased a controlling interest in the First National Bank of Dubuque and I became its President. Dubuque has been good to me with profitable business, a good home and a fine family. No one could enjoy retirement more than we are, with good health and a mutual interest in so many activities." Wally married Therese White of Rockland, Maine, and they have a married daughter, Nancy; two married sons, William and David; and six grandchildren. We hope those travels will include a stop at our 50th, Wally.

As of early April, our new Assistant Secretary, **Sumner Hayward**, noted: "You were really prophetic when you wrote the copy for the April Review. Yesterday afternoon, I came home from a six-mile hike in Harriman State Park along with three neighbors, includ-

ing Malcolm Lees, '20, to find your words in the *Review* awaiting me. It had been a glorious day and we ate our pack lunches atop Claudius Smith Rock near Tuxedo, N.Y. Betty and I fly from Kennedy April 25 for London, returning from Shannon on June 3. We'll spend two weeks in London, one in Cheltenham, a few days in Chester to see Wales briefly and the rest of our five weeks in Dublin and Killarney. If I'm not exhausted on return, I might show up on Alumni Day. Warm regards to you both." Asec Sumner also sent a card from London a week after arrival, saying their hotel was near Piccadilly Circus; that they had seen three plays, including *Canterbury Tales*, just reviewed in *Time Magazine*; and had gone to Brighton to see the Royal Pavilion. Alex and **Munnie Hawes** recently showed us a picture post card Sumner had sent from England in 1966 postmarked "Hawes" in Yorkshire. . . . **W. Robert Barker**, 5755 Beattie Avenue, Lockport, N.Y. 14094, says he retired in 1964 from the commercial banking operations of Marine Midland Trust Company, Lockport. His note, postmarked in Bonita Springs, Fla., tells of continued interest in Kiwanis, fishing and golf, the last at the Lake Lawn Country Club in Fort Myers, Fla.

Ed Dube sent a letter he received from Mrs. George S. Piroumoff, 800 Park Avenue, New York, N.Y. 10021, saying: "It was very pleasant to receive your personal note to my husband. I wish that he could answer it himself but, unfortunately, he has been ill for the past few years and is unable to attend to his own affairs. George has always felt very close to the Class of '21 and is appreciative of his years at M.I.T. and I wish we could attend the 1968 Alumni Day as well as look forward to the 50th Reunion." We are sorry to hear of George's illness. Write a note to George and Gladys. . . . **Ralph W. Wood**, 24 Holbrook Avenue, Rumford, R.I. 02916, retired in 1966 as Electrical Engineer in the Public Works Department, Northeast Division, U.S. Navy, Boston. Ralph is active in the University and Camera Clubs and the M.I.T. Club of Rhode Island. He and Lucile have two married sons, Dean, who was graduated from Bowdoin, and Duncan, University of Vermont, and five grandchildren. . . . **W. Hoyt Young, Jr.**, retired in 1963 as Associate Patent Counsel for the Naval Electronics Laboratory, San Diego, Calif. Bill has a law degree from Rutgers and previously maintained his own patent law office. During World War II, he was a commander in the Naval Reserve. His mail address is Route 1, Box 1101, San Marcos, Calif. 92069. . . . **Richmond S. Clark**, P. O. Box 3807, Baytown, Texas 77520, has written to Ed Dube, in part: "I have had quite a rough time since last July. Two weeks in the hospital at that time; then for the month of September in Methodist Hospital, Houston, where they specialize in cardiology. I seem to be well on the way to recovery now and hope Mary Louise and I will be

present at the 50th Reunion in 1971." Rich also wrote to **Irv Jakobson** that he still does not drive or use his boat but hopes he can make short trips on it this summer to the Galveston beaches. . . . Ray St. Laurent sent us a letter from **William H. F. Rose, Jr.**, who wrote: "My disappointment at not seeing you as you went through is great. I should have told you of our latest move. We are still looking for an old, typically New England house which we can fix up and restore. Helen and I are now in Hancock, N.H., which we like very much. The house is a stop-gap until we find what we want. The address is Norway Hill, Hancock, N.H. 03449, and the telephone number is 603 525-4417. If you get up this way again, stop by. I have wanted to see you in Manchester but never know when you'll be there. Do you ever light long enough to do anything but pay your taxes?"

It is with heavy heart that we record the passing of two of our members and send sincere sympathy to their families on behalf of everyone in the Class.

Alexander Duer Harvey of 133 East 64th Street, New York, N.Y. 10021, died on January 9, 1968. Born in Weehawken, N.J., on September 5, 1899, he prepared for the Institute at Andover. At M.I.T., he was a member of Sigma Alpha Epsilon, Theta Tau, Pi Delta Epsilon, the Beaver Club and Stylus. He served as Editor in Chief of *VooDoo* and was a member of the staff of its predecessor, *Woopgaroo*. Dan was elected Class Vice President in our senior year, to the Technique Electoral Committee, as Chairman of the Junior Prom Committee, to the Junior Week and Tech Night Committees. He continued active in '21 affairs and was Chairman of our 25th Reunion Committee. During World War I, he attended the Coast Artillery School, Fort Monroe, Va., and was commissioned a First Lieutenant, Coast Artillery Reserve Corps. He was graduated in Course III and became Sales Manager of Nash Engineering Company, South Norwalk, Conn. Later, he was Sales Manager of the Building Insulation Division of Kimberly Clark Corporation, Chicago, and then President and Director of Paul Valve Corporation of New York and Bloomfield, N.J. He had also been Director of the Investment Division of the Small Business Administration in Washington and retired in 1966 as President and Treasurer of Harvey Leith Enterprises, Inc., of New York City, devoted to small business consultation, chiefly for management and finance. He was a member of the Board of Management of the Hospital for Special Surgery, New York, the Century Association of New York, the Anglers Club and the University Club of Washington. He is survived by his wife, the former Nancy Jay of New York; a son, Dereke, Lenox School; a daughter, Phoebe, Bryn Mawr; and three grandchildren. We are indebted to Ed Dube for aid in preparing these notes.

Newell Arthur Grover, 2784 35th Ave., San Francisco, Calif. 94116, died on January 12, 1968. Born in Rutland, Vt., on December 12, 1899, he prepared for Technology at Rutland High School. At the Institute, he was a member of Theta Xi, the Civil Engineering Society, its Vice President in the junior year, and a member of the tug-o-war team. During World War I, he was a Private in the S.A.T.C. at M.I.T. He was graduated with us in Course I and joined the L. C. Mott Company in San Pedro, Calif. He later became associated with the Division of Highways of the State of California and was long its right-of-way agent, with headquarters in San Francisco. . . . Until we get together again in the fall around this friendly '21 fireside in the pages of the *Review*, won't you please write and tell us about your activities in retirement or otherwise, your travels and family or whatever else you have of interest to the rest of us. If you are in the neighborhood of Brielle on the New Jersey Turnpike or the Garden State Parkway, at least stop and say "hello." Have a happy summer!—**Carole A. Clarke**, Secretary, 608 Union Lane, Brielle, N.J. 08730; **Edwin T. Steffian**, Assistant Secretary, c/o Edwin T. Steffian and Associates, Inc., 19 Temple Place Boston, Mass. 02111; **Summer Hayward**, Assistant Secretary, 224 Richards Road, Ridgewood, N.J. 07450

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Your Secretary, like Mark Twain's reporter, has mistakenly extended the sympathy of our Class to the family of **John William Strieder** after receiving an erroneous report and an article of appreciation from his first resident. Deep apologies are offered to his friends and family. **Bob Tonon** found that John and his wife were traveling in Europe during the issue of the *May Review* and in the best of health. . . . **Frank Kurtz** also writes that he has had several visitors from M.I.T. including Classmates Lee Carroll, Don Carpenter, Dale Spoor, Herb Ham and Harry Rockefeller. Frank took an interesting trip on the way to our June Reunion. He left Florida the middle of May and traveled by way of Cedar Key, Winston-Salem, Williamsburg, Richmond, Elizabeth, N.J., Skytop and Trumbull, Conn. He visited his older son in Trumbull and traveled around the East before returning to Delray Beach in July. . . . **Benjamin W. Thoron** of Mt. St. Alban, Washington, D.C., has retired as Treasurer of the Washington Cathedral Foundation. He has had another interesting photographic safari—to Kenya, and Tanzania in February—spending three weeks under canvas. . . . A piano recital program has been received from the Cheshire Academy for April 9, 1968. Included in the recital by James Loder were the works of Beethoven, Schumann, Brahms, Chopin, Elmer and DeBussy. You will notice that our Classmate, **William B. Elmer** is now listed among the classically great

composers. We agree that Bill is still triumphantly productive and in high gear.

A good letter from **Bill Mueser** of New York tells of his visit to the Orient this spring. Due to doctor's orders and an unexpected operation, Edna was not able to take the trip and therefore their Hawaiian vacation section was omitted. Bill went to Hong Kong, Taipei and Tokyo and returned early in March. He writes that Edna has greatly improved although her program is for a longer convalescence than they had hoped. His trip to Hong Kong was in connection with a large project—90 21-story buildings which will ultimately create 14,000 living units of two, three, and four bedrooms for middle class Chinese.

Abbott Johnson of Muncie, Ind., has written from the Imperial Hotel in Tokyo regarding his winter cruise of the South Seas and the Orient. He has had a most successful reunion with many M.I.T. men aboard and will later tell us of the trip. . . . Interesting pictures have been published recently including **Crawford H. Greenewalt** as Chairman of the Finance Committee of Du Pont as compared to the Executive Officers when Crawford became President in 1948. The older photo showed four living former Presidents whose experience dated back to 1915. . . . An encouraging note is that **Clifton B. Morse**, formerly '21, of Salinas Calif., wishes to affiliate with the Class of '22. He is most welcome! . . . It was previously reported that **Fritz J. Roethlisberger** has retired as the Wallace Brett Bonham Professor of Human Relations, Emeritus, after 40 years at Harvard. He is best known for his work associated with extensive research for Western Electric on worker motivation. He was quoted as saying: "What is important is that the spirit of inquiry persists. In spite of all our progress, man's relation to the machine is still an unanswered question." . . . **Everett M. Strong**, Professor of Electrical Engineering at Cornell University, has received the Illuminating Engineering Society's

Gold Medal in recognition of his leadership in research and programs in light and vision. He originally worked for the General Electric Company, in Cleveland and used this industrial experience to aid him in teaching. He directed the Industrial Cooperative Program for more than 20 years. Because of his understanding of student problems upon entering industry, he stresses that on campus it isn't possible to expose students to the situations, equipment, and, especially the environment that they encounter in industry. Whereas competition is often foremost in university life, co-operation is more the keynote in industry.

The sympathy of the Class is extended to the family of **Adolph B. Alland**, of San Rafael, Calif., who passed away on December 24, 1967. Also, we recently learned of the death of **Clarence L. Scamman** of Surrey, Maine, in June, 1965. . . . Among the changes of address are: **Reginald S. Hall**, Norfolk, Conn.; **J. Russell Hemeon**, Lakewood, N.J.; **Yoshinori Chatani**, Tokyo, Japan; **Platt C. Benedict**, Los Angeles, Calif.; **William R. Nichols**, Coronado, Calif.; **Harold D. Stanley**, Ft. Lauderdale, Fla. Here's hoping for a most pleasant and healthful summer to you all for relaxation and joy.—**Whitworth Ferguson**, Secretary, 333 Ellicott Street, Buffalo, N.Y., 14203; **Oscar Horovitz**, Assistant Secretary, 33 Island Street, Boston, Mass. 02119

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Many classmates have written to me about the Reunion. **Kenneth C. Kingsley** writes that he is sorry he could not attend the 45th. Ken says: "**Al Redway** and his wife Dorothy recently visited us at our Palm Desert home. Adalaide and I had tentatively planned to attend with them, however, a conflict of dates we cannot avoid has caused us to change our plans. We are truly sorry for this but wish you the best for a marvelous gathering which we know you will have." . . . **Hubert L. Williams** could not be with us this year but says, "Count me in in 1973." . . . **Arthur R. Belyea** was unable to attend but sent us his best wishes. . . . From **Edward McSweeney** who is now living in Woods Hole: "I am planning to go to Europe, but while my schedule isn't final, I will have to be away during the Reunion." . . . **Robert E. Hendrie**, who was out of the country in June, sent best wishes. . . . **E. Louis Greenblatt** was also abroad in June. He wrote: "I have delayed making my reservations at Bass River pending a previously scheduled trip to Southern France about 10 days before our Reunion . . . My itinerary calls for my return to Boston on Saturday evening, June 8. This will prevent my being with you at Bass River but I am making a reservation to attend Alumni Day and I hope to see you and those of our classmates who will be there." . . . **Basil O. Stewart** wrote: "Sorry, I won't make it to the Reunion this time. We are

scheduled to fly north in July or August to visit two sons and their families—one in Swarthmore, Pa., and the other outside of Hartford, Conn. If you have the opportunity, please give my best regards to **Herman Bruson**, **Archie Williams** and **Hyman Marshall**." . . . **Julian Loewus** wrote: "It will be impossible for me to attend this year's Reunion. We have reservations to visit the mineral baths at Hot Springs, Ark., June 2-22. Both my wife and I need the baths and this is the first time in several years I've been able to persuade her to go with me. Hope you all have a wonderful time." . . . **John H. Zimmerman** could not make Bass River, but he was planning to be at Alumni Day. . . . **Harold B. Gray** reports: "June happens to be a bad time for me to come East—just got back from a couple of months in Hawaii and am sort of buried with things that will take quite a bit of time for awhile. Fiftieth Reunion—who knows?" . . . **Peter Petersen** of Norway could not come in June; he plans to attend our 50th Reunion and sent us all good wishes.

Mrs. Herbert A. Barnby would like to have been with us. She wrote: "Your letter concerning the M.I.T. Class of 1923 Reunion is very welcome and the mention of M.I.T. class reunions brings many happy memories to me. How I wish my dear husband, Herbert, who died three years ago, were here and I am sure our names would be among the names of those attending. Since I am now busy getting ready to sell our home and then make a move to something smaller, I shall not be able to be with you. I want to say that I appreciate being given the opportunity to be there and, indeed, I wish I could. Please remember me to all, and it is my sincere wish that all who are present this year may be able to be back for the 50th Reunion in 1973." . . . **Cecil H. Green** wrote: "I just want you to know that because of long-standing travel plans during June, my wife and I will be unable to attend our 45th Class Reunion at Bass River. I am particularly sorry about this because of never making one in the past, but perhaps I can do a better job of catching the next one!" Cecil sent us all his best wishes. . . . **Miles N. Clair**, **Henry P. Culver**, **Robert H. Kean** and **Walter E. Richards** all sent their regrets at being unable to attend the Reunion.

Jose C. Bertino of 11 de Septiembre 927, Apt. 1-B, Buenos Aires, Argentina, has written to tell us something about himself. Jose is a graduate of Course XIII. He is a member of the M.I.T. Club of Buenos Aires, which he helped to build in 1941—he has been Secretary of the Club since 1933 when he was appointed by the late Dr. Compton. On July 22, 1966, Jose married Alicia M. Huergo. In 1966 the Bertinos traveled to Japan and spent four months visiting points of interest, among them: Tokyo, Kyoto, Nagano, Yokohama and Hiroshima. In 1967 they spent five months in Europe. After graduation Jose worked for a time in the Fall River Shipyard



Fritz J. Roethlisberger, '22

and in Groton, Conn. He says: "I wrote . . . because I cannot go to our 45th Reunion. Please give my best regards to all of our classmates." . . . **James B. Wyman**, 856 1/2 Green Street, San Francisco, Calif., is now confined to a nursing home. . . . **Edmund J. Thimme**, 376 North Fullerton Avenue, Upper Montclair, N.J., has been promoted to Assistant to the Vice President of the Public Service Electric and Gas Company. He started with Public Service in 1923 as a cadet engineer and, upon completion of the training course, was assigned to the Passaic Electric Distribution Department as an engineer. He subsequently held the positions of Division Distribution Engineer, District Superintendent of the Passaic Division, Industrial Relations Manager, General Superintendent of Distribution, and General Manager of the Electric Department, before receiving his current promotion. Mr. Thimme is a member of the American Institute of Electrical Engineers, the Edison Electric Institute, the New Jersey Society of Professional Engineers, the M.I.T. Club of Northern New Jersey, the Glen Ridge Country Club and the Water Gap Country Club.

Joel Y. Lund has just returned from a trip to Spain and Portugal . . . **Gerald A. Fitzgerald**, a Professor at the University of Massachusetts, reports that he is engaged in "research in the total distribution approach to lower costs of commodities." He hopes to continue as a consultant following his retirement in 1969. . . . **Bernardo Elosua**, General Manager of Ladrillera Monterrey, S. A., Apdo 360, Monterrey, N.L., Mexico, reports 31 grandchildren! . . . **Archibald Williams**, Vice President, Industrial Engineering, Emhart Corporation, reports an increase from six to seven grandchildren. For the past two years he has been engaged in directing a group of engineers in planning and building a new manufacturing facility. He says: "A 20-year dream coming true is now nearing completion, then retirement in December with completion of project. My other interests are my wife, grandchildren, photography and antiques, in that order." . . . **Joseph C. Nowell, Jr.**, reports that he retired in 1966 but continues on a part time basis as a consulting engineer. . . . **E. D. Ries** has retired from E. I. du Pont, Wilmington, Del. . . . **Philip S. Wilder** reports two children and six grandchildren. He writes: "Theoretically retired, except as a part-time Foreign Student Advisor at Bowdoin College. I seem to be keeping pretty busy, and am now trying for the Republican nomination for Representative to the State of Maine Legislature."

Harold C. Pearson writes: "It occurs to us that you would like to know that the following of our classmates were with us for our 20th Annual Fiesta in March: **Herman A. Bruson** and his wife Virginia, and **Benjamin F. Powell** and his wife Lisbeth. . . . **Atherton Hastings** wrote to Alan Allen: "Thanks for your kind letter. Our daughter, her

husband and the grandchildren are planning to visit us during the summer. They are coming from Canada, and we have not seen them for 1 1/2 years. They both teach at Mt. Allison College in Sackville, New Brunswick. I am enjoying retirement, after working with T.V.A. as a chemical engineer for 25 years. I had charge of Instrumentation and did process engineering and special studies in the Office of Agricultural and Chemical Operations. Now I spend as much time as I care to on hobbies and other projects. Thanks again for writing and remember me to the boys in good old Course VIII. . . . **Alan R. Allen** writes: "I think I established a new record at M.I.T. this last trip—that of being the first M.I.T. graduate over 70 to walk up the whole 422 steps from the cellar to the roof (without stopping) in the new Cecil Green Building. Of course, my normal quota every morning here in my hotel in New York is 472 steps; so to make up, I ran down the 20 flights to the ground floor and walked back up to the first floor. That added 62 steps for good measure."

Charles E. Roche reports four children and five grandchildren. His special interests are studies in thermodynamics. He says: "If any classmates find themselves in the vicinity of my home (850 Hamilton Street, Rahway, N.J. 07065) I would be pleased to have them drop in. I enjoy good health and am a happy and contented 'ol' buzzard." . . . **Paul Ver Beck Heiss**, Manager of Costs for the Chesapeake and Potomac Telephone Company, died on October 31, 1967. He lived at 6611 Western Avenue, N.W., Washington, D.C. 20015. He had been with the Telephone Company in the Traffic and Commercial Departments since his graduation. Mr. Heiss was Secretary and an active member of the Cosmopolitan Club of Washington, a life member of the Alexander Graham Bell Chapter of the Telephone Pioneers of America and a member of St. Albans' Episcopal Church. . . . Word has been received of the death of **John D. Cochrane, Jr.**, 1101 Aqua Lane, Fort Meyers, Fla., on September 26, 1967. . . . Word has also been received of the deaths of the following classmates, but no details are available at this time: **Lester S. Champion** who died two years ago; **Charles W. Gallaher** who died in August, 1967; **Harry P. Chupas** who died on March 22, 1967; and **Roswell A. Merritt** who died in May, 1967. . . . The following are changes of address: **Erwin G. Schoeffel**, 148 Wilson Hill, Massena, N.Y. 13662; **Joseph Fleischer**, 3001 South Ocean Drive, Hollywood, Fla. 33020; **Lyman L. Tremaine**, 630 3d Avenue, New York, N.Y. 10017; **Harold C. Pearson**, 1 Rosedale Road, Apt. 207, Toronto 5, Canada; **Emil S. Birkenwald**, 6851 Roswell Road, N.E., Apt. A1, Atlanta, Ga. 30328; Mrs. Channing P. Clapp, 149 Matawan Avenue, Matawan, N.J. 07747; Mrs. Eger V. Murphree, 6849 North Ocean Boulevard, Delray Beach, Fla. 33444; **Allan G. Mealsin, Jr.**, 6595 Goodwood Avenue,

Baton Rouge, La. 70806; **George R. Hurley**, Route 2, Box 244, Burlington, Wis. 53105; **Harold B. Gray**, Rural Route 4, Syracuse, Ind. 46567; Mrs. John D. Cochrane, Jr., 3675 Broadway, Fort Meyers, Fla. 33901. . . . Mail to the following classmates has been returned marked "address unknown"—please notify your Secretary at once if you know any of the addresses: **Dewitt W. Bennett**, **Orr N. Stewart**, **Roy C. Sampley**.

In completing my five year tour of duty as a Class Officer I would like to thank **Bert McKiltrick** and all of you who have sent in news items and letter responses. It has been a pleasure and an honor to have served as your Secretary-Treasurer. I also take this opportunity to thank the Alumni Office Staff which has been so co-operative this past term. I most sincerely say thank you, and extend to all my classmates my kindest regards and best wishes until we meet again for our 50th Reunion in 1973.—**Forrest F. Lange**, Secretary, 1196 Woodbury Avenue, Portsmouth, N.H. 03801; **Bertrand A. McKiltrick**, Assistant Secretary, 78 Fletcher Street, Lowell, Mass. 01852

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Well, the Great Search is over, and your committee (**Russ Ambach**), has done us proud. Our reunion spot for 1969 has been chosen, and it's a beauty. It's also a radical departure for a class that has always "reunited" by the sea. Next June we shall be gathering on the shores of Lake Winnepesaukee in the foothills of the White Mountains, a truly spectacular part of the country. The Bald Peak Colony Club serves the same purpose as the Oyster Harbors Club did. It is the focal point of a sizeable colony of summer residents, with all the facilities such people demand. There's a fine 18-hole golf course, a putting green, bowling green, three all-weather tennis courts, and a beach reputed to be the best in all New Hampshire. The lake has plenty of fish—salmon, lake trout, bass, pickerel, etc.—but as every fisherman knows, there's no guarantee they will want to be hooked. Boats and tackle are available in the village nearby, and a 7-day license costs only \$5. It will be a challenge for **Al Roig**—some of those lakers come big. For the less athletically inclined there is a multiplicity of bars and plenty of rocking chairs on the porch from which to drink in the view. A drive around the Colony roads at night is sure to result in shining a number of deer. We'll have lots more details for you in later publicity, but for the moment be sure and make your plans to be in Melvin Village, N.H., at the top of Winnepesaukee next June 13 to 15, and then come down to Cambridge for Alumni Day on Monday, June 16. They're exactly 100 miles apart.

Now to the current news. We told you a couple of years ago about **Ellis O. Jones**

retiring from Ethyl Corporation, then going to work for the Department of the Interior. For a year or more Ollie got in a fair amount of traveling at government expense, then retired once again. Now he's enjoying a more sedentary life in Santa Rosa, Calif., "a delightful community." . . . **Clarke Williams** is not the only classmate sitting in judgment for the A.E.C. In April there was a meeting in Nebraska to consider an application for a nuclear power plant permit from the Omaha Public Power District, and one of the Board members was **Hood Worthington**. M.I.T. had a majority on that three-man board. Another member was Clark Goodman, Ph.D.'40 in physics, and a former faculty member. Undoubtedly the first M.I.T. reunion ever held in the Washington County Courthouse. . . . A retiree seeking elective office was **John T. Blake** who got his Ph.D. with us. Now living on Cape Cod, he was a candidate this spring for the Nauset Regional School Committee. Like so many news items, this one had no followup to tell whether or not he made it, but if credentials mean anything, he should have. "He received a Ph.D. from M.I.T., has taught at three institutions of higher learning, has been a trustee of one for 10 years, has received degrees from two, and has been a Trustee to Industrial Aids to Education, Inc." However, one can never be sure when the opposition is a woman, especially when she is a "property owner and head of her household," a formidable combination.

When we reported that **Jimmy Crist** had picked up a directorship in Anderson Electric (Leeds, Ala.), we thought it was just one more of a long string. Maybe it was, but it's developed into something more. Now he's not only a director but also a member of the Executive and Finance Committees and Chairman. Sounds as though retirement didn't take. . . . Seems we missed out on one of the '24 couples attending the Mexican Fiesta. **Tien Koe** and his wife, Victoria, were also there. To the best of our knowledge neither he nor **Joe Young** has ever attended a major M.I.T. affair before. Let's hope they do a repeat and that we see them at Bald Peak next June.

Now for some sorry news. **Hank Simonds** will not be with us at the 45th. He died on the 22d of April at the Marine Hospital in San Francisco. It was not unexpected. For the past year he had suffered from a kidney condition that grew steadily worse. Through the years Hank had been our most loyal and regular correspondent. As a Chief Engineer on cargo vessels he had been around the world many times. He was torpedoed in the South Pacific, dive-bombed in the Mediterranean, and shot at in the Mekong Delta. His cards came from such exotic places as Bahrein, Dakar, Aruba, and Thule, each with some item of interest and invariably signed "Barnacle Bill." In every port where there was a classmate he looked

him up—**Jimmy Wong** in Kowloon, **Emilio del Prado** in Manila, **Royce Greatwood** in Tokyo, **Harold Hazen** and your Secretary in Cambridge. It was like Hank to get word to Royce, now a California neighbor, two weeks before he died, to be sure and let me know when the end came. Hank alternated with his brother in keeping up the family burial plot just north of Boston, coming east every other year for that purpose. Now Hank's ashes are resting there. Mrs. Simonds, Joyce, is principal of one of the high schools in Petaluma, their home town north of San Francisco, and son Charles is a graduate student in geology at the University of Illinois. To them both go the sympathies of the Class. . . . Belatedly we learn of two other deaths, those of **Walter W. Carlson** last September, and **Charles W. Fahrenbach** a month later. There are no further details.

A whole summer lies ahead. Do take a moment to drop your Secretary a line so the Class can catch up on what you're doing. And next fall we'll fill you in on more details about our forthcoming Reunion a year hence. In the meantime, take it easy and stay out of the hot sun.—**Henry B. Kane**, Secretary, Lincoln Road, Lincoln Center, Mass. 01773

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Henry Sachs, one of our most faithful classmates, submitted to me what he classifies as his "Annual Report" a few weeks ago. This past year, Henry and his wife went on a camera safari to East Africa, a trip which he classifies as one of the most delightful and exciting experiences they ever had. Such trips have to be planned well in advance, so that a year ago they had made their arrangements for the trip which began in February. Henry was able to combine business with pleasure to the extent that he took care of various matters in London before moving on to Rome and then to Nairobi. Their safari lasted for 23 days and took them through the Masai country of Kenya to Tanzania, back by the foot of Mount Kilimanjaro, and back to Nairobi. The numbers and varieties of wild animals which they saw, many of them from close vantage points, are almost unbelievable. They were most fortunate in seeing the fantastic "migration" in the Serengeti which takes place only twice a year. The entire horizon was blackened by literally tens of thousands of zebras and wildebeest. From Nairobi they went to the Tree Tops Hotel; and from there to the Mount Kenya Safari Club, where they chartered a small plane and flew for two hours to Uganda and the Murchison Falls of the Victoria Nile. Their return trip to Rome took place during the height of the Asian migration caused by the stringent racial laws in Kenya. The natives were inundating the airport, endeavoring to get on chartered flights to London before the immigration

laws were changed, and there were delays and difficulties in getting aboard on their flight. They returned home in time to become grandparents, and are delighted to report that their daughter had twins, a girl and a boy. This outline of Henry's trip does not do justice to his report; but if any of you are in New York, do get in touch with him and I am sure he can tell you of his many thrilling experiences.

Through the thoughtfulness of Harold Pearson, '23, word reached us that **Ben Oxnard** and Virginia were at the 20th Annual M.I.T. Fiesta in Mexico City last March. . . . A fine letter came from **Franklin Fricker** a few weeks ago. After almost 40 years with the Ethyl Corporation he was retired at the end of September, 1966. His first years with Ethyl were spent in various parts of the world, introducing antiknock gasoline to the petroleum industry and the public. From 1930 on, he was with the R. and D. group in Detroit where he had a number of administrative and executive responsibilities, handling legal, governmental and community relations for the Michigan Headquarters. His community relations assignment he found beneficial in a way, for it threw him into all sorts of activities supported financially by Ethyl, such as community drives, hospitals, social agencies, etc., and even got him into a spot on the Selective Service Appeal Board. In his retirement he has continued with most of these associations in the areas of community service. He is still on the Board of Trustees of the William Beaumont Hospital in nearby Royal Oak, of which he was a founding Trustee in 1949. This hospital has expanded from 259 beds to over 700 and is one of the largest in Michigan. Since retirement, Frank and Dorothy have gotten the traveling bug and have visited Europe several times; and last fall ventured into the Far East, visiting Japan, Taiwan, Manila, Hong Kong, Singapore, Bangkok, etc., with stops in Hawaii both going and coming. In 1969 they are planning to visit Central and South America. As of the middle of May, the Frickers are returning to their home in Birmingham, Mich., having spent the past winter in Naples, Fla.

Via the M.I.T. Alumni Fund Office, we had news regarding **Gordon Creveling** who has recently returned from Spain after three years in an advisory position with U.S. Steel International. He is presently recuperating from an illness which has plagued him since his return, and we wish him a speedy recovery! . . . I am sorry to report the death on February 6, 1968, of **Edwin R. Buchman**, a Research Associate in Organic Chemistry at the California Institute of Technology where he has been since 1937. Before going to Caltech, he had carried on research at Columbia University and was responsible, with two colleagues for synthesizing vitamin B-1. He continued his work on vitamin B-1 at Caltech, and during World War II

helped direct an antimalaria research project there. He also conducted exploratory work on the problem of the synthesis of cyclobutadiene; and during the past 15 years, he has been involved principally in mathematical research. . . . I am sorry to report that **Pace Hammond's** wife, Margaret, passed away on April 13, 1968; and **Watson B. Hastings** died at Dobbs Ferry, N.Y. on March 19, 1968.—**F. L. Foster**, Secretary, Room E19-702, M.I.T., Cambridge, Mass. 02139

26

This month notes are being put together by—the-sea but instead of Pigeon Cove its Bermuda. Our first day here brought much needed (not by us) rain to the island so its a good day for class notes and for shopping. The riots of 10 days ago have raised havoc with the tourist business here in their normally peak month of May. Last evening the 707 that brought us from Boston had 30 vacant seats while normally it is filled, and reports we have picked up indicate that there have been 5000 cancellations. Everything appears serene and their curfew was lifted last night but there seems to be a tenseness and also a deep concern for what happened and why. It's such a beautiful island and has always seemed to be such a happy island that we cannot believe a little flare-up cannot be smoothed over. . . . Our love of the sea appears to have won another non-class reader for the '26 notes, Bern J. Schnyder, '60, of the University of Berne, Switzerland. John Mattill, Review Editor, recently met Mr. Schnyder in San Francisco and learned of his interest in our Class. We will try to keep him interested. We too enjoy skipping around the notes to see what is going on with the other classes. Recently a picture caught our eye in the '42 notes. We have known Bruce Anderson for several years but until his photo appeared in the notes telling about his promotion in United Shoe Machinery Corporation we didn't even know he was an M.I.T. man. Try doing some notes hopping—it's real interesting.

Before I tell you about my shopping expedition, lets see what some of the Class write on the backs of the return envelopes to the Alumni Fund that are turning out to be a Class Secretary's life saver. Here's what **Leonard Remington** wrote: "After being General Manager of the Thomson National Press Company located in Franklin, I was recently made Vice President. I have traveled exclusively for the company—to Japan twice—around the world once and Europe many times." . . . One from **Allan Laing** says: "Major recent activity has been Chiarmanship of the Committee on Curriculum Revision in Architecture at the University of Illinois. Spent most of last summer visiting Greek archaeological sites and French cathedral restoration work. Europe generally far ahead of U.S. in registra-

tion and preservation of historic sites and buildings but we are making progress and recent congressional action will help." . . . **Mark Greer** writes from Connecticut: "Have continued heading up the development of our Boy Scout Camp of Middlesex County Council. Raised the funds in '65; actual development of 390 acres and facilities in '66 and '67. Trout fishing in Connecticut and Colorado is good. Grouse and woodcock hunting has been poor." . . . **Henry W. Jones** seldom writes but he came through with a most interesting back-of-the-envelope communique. "Had lunch at the home of **Julius Voster** in Cologne, Germany, this past May. Doc and his wife Inge were charming hosts to Polly and me. It was a delightful day—after 40 years. Doc was in Chemical Engineering Practice School with me at Bangor and Winchester."

We have previously reported about **Jim Killian's** assignment as Chairman of the Carnegie Commission on Educational Television whose report led to the establishment of the Corporation for Public Television of which Jim is a member. At last week's Alumni Council Meeting Jim elaborated on this development with emphasis on its effect on urban affairs. He had a local example of the use of educational television to help promote understanding after the murder of Dr. Martin Luther King. A negro soul singer named James Mason had been scheduled at the Boston Garden for the next night. Rather than cancel out, the Mayor of Boston talked Educational TV Station WGBH into broadcasting the program so that many would stay home and so that a message could be addressed to the entire community. It helped, and Boston was spared from the tragedy that befell so many cities. We chatted briefly with Jim before the Council meeting and he expressed surprise to have learned from the class notes that **Cedric Valentine** is living in the New Hampshire area near where Jim has acquired a home. We had been surprised to learn that Jim had a place in New Hampshire and learned that he and Liz bought a 200-year-old house about a year ago. They have been doing a major renovation of the house and, according to Jim, it's still going on. Jim and Liz owned a home in New Hampshire for about a year 20 years ago but now it looks serious.

Before winding up I'll let you in on this morning's shopping spree which included the usual Daks and sports-jacket. The important purchase was a half model of a ship, 34" long mounted on a plaque 9" by 46", but with papers to show it was made in 1847 which will get it in duty free (I hope). There also were two antique hand carved Neptunes that we are going back to look at tomorrow. The spot is already for them in the study at Pigeon Cove but we also hope to be able to duplicate them in Arborlite, our high density urethane composition. . . . Someone

just mentioned that the cocktail hour was about to arrive so with best wishes to all for a pleasant summer Cheerio 'till fall—and please continue writing to us on the back of an envelope. . . . Upon returning home we find an airmail letter from San Carlos, Mexico. Harold Pearson, '23, had kindly written us the names of the '26 people who attended the 20th Annual Fiesta of the M.I.T. Club of Mexico City. They were **Chester Buckley** and his wife Dorothy and **Eben Haskell** and his wife Opal. Many thanks, Harold. . . . And once again Cheerio until fall.—**George Warren Smith**, Pigeon Cove, Mass.

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James B. Bell, owner of James B. Bell and Associates of 207 East 32d Street, New York, died on July 7 of last year. Jim came to Tech from Cincinnati in his junior year. He graduated in Course IV. . . . Late word has been received of the death of **Sidney Gerber** on May 16, 1965. Sid came from Seattle, Wash., and entered Tech in his freshman year after attending the University of Washington. He was married in 1935, and became President of the Anderson Thompson Ski Company in 1939. His hobbies were skiing and yachting, and he traveled extensively throughout the world. . . . Our newly elected Class President, **Dike Arnold**, and his wife Eloise were playing gin rummy and watching TV on the night of April 3 when the doorbell rang. The visitors were armed bandits who hit Dike on the side of the face with a small pistol and gagged and blindfolded them both. The whole house was then ransacked. Understating the situation, Dike says it was "not a very pleasant experience," and we can only agree with him. The police found no clues. . . . Make a mistake and you get a letter to put you right. I'm grateful to **Louis Eaton** for letting me know that he has not moved to Florida—as I said in the notes—but does spend four months in the winter in Naples, Fla. Lou's official address is Box 132, Duxbury, Mass. 02332, and in the summer, Sandwich, N.H. Lou was in the Amherst Class of 1915 and a cut above the rest of us in age. He was at M.I.T. for a year of electrical engineering and math courses and then went with Brockton Edison, from which he retired as President in 1958. Like his father, Lou's son, Allan took a degree at Amherst (1944) and at M.I.T. (1948). Lou worked on the M.I.T. Capital Fund, is a ham radio buff, and has been President of his Amherst class for the past five years.

In addition to the honors recorded in the May notes, **Nat Cohn** has been awarded the Lamme Medal by the Institute of Electrical and Electronic Engineers. . . . The Fiesta Committee of the M.I.T. Club of Mexico City was good enough to write us that **George Cunningham** and his wife Betty were at the 20th Annual Fiesta in March.

Howard Burt, who is retired and living at Chapel Hill, N.C., represented the Institute at the inauguration of Albert N. Whiting as President of The North Carolina College at Durham, N.C.

... **Hermon Swartz**, Secretary of the Class of 1928, has very rightly called my attention to an error in the May, 1927, class notes. In them I said that the Secretary of 1928 was scouting other classes for tips on the successful reunion. As the Class of 1928 did not give its Secretary this assignment, I hereby call attention to the fact that it was the Class of 1933 that was involved. ... New addresses received are: **Eric G. Piper**, Abbey Road, Dover, Mass. 02030; **Richard L. O'Donovan**, 210 Calabria Avenue, Miami, Fla. 33134; **Elwood A. Church**, 2 Mansion Road, Marblehead, Mass. 01945.—**Joseph S. Harris**, Secretary, Box 654 Masons Island, Mystic, Conn. 06355

28

We hope to make our notes brief this issue so that you can get back to summer pleasures quickly. ... Our old friend **George Mangurian** stopped at our office on April 11, but unfortunately we were not on duty. He was here from the West Coast to attend his brother John's funeral in Arlington. George is Program Manager of Deep Submergence Systems Program for Northrop Northronics in Palos Verdes Peninsula, Calif. 90274. ... From **Jim Nargis** we read that he is a partner in the firm of Nargis and Darden, architects in Fresno, Calif. Their practice is somewhat limited to schools, churches, and hospitals. Jim is a past President of the San Joaquin Chapter of the American Institute of Architects. He is a member of the Civic Advisory Center Committee and a Trustee of Fresno County Historical Society. ... From the *Wingfoot Clan*, publication of the Good-year Tire and Rubber Company, we quote: "**Albert J. Gracia**, Vice President of Research, has been re-elected to a second term as President of the Ohio Citizens' Council for Health and Welfare. Gracia is a past President of the United Community Council of Summit County and former Chairman of the U.C.C.'s Central Budget Committee." ... And from the same issue of the publication we learn that **John J. Hartz**, Vice President, Tire Development, headed the list of Akron speakers at Goodyear's annual tire Development Conference. John was elected Vice President of Tire Development in early April. He had been Director of Tire Development since 1964 and is responsible for all phases of the company's tire development, engineering and rubber compounding programs as well as its tire testing facilities. He has had more than 37 years of experience with the company, starting in 1929.

We quote from a letter received by **Jim Donovan** early in May from **John Houpis** from Athens, Greece: "Greetings to you and all 28'ers from sunny

and beautiful Athens. I came here in August, 1965, immediately after my retirement from the U. S. Army Research and Development Laboratories, Fort Monmouth, N.J. I came chiefly to please my wife and to rest and relax my weary body—I am now 68 years old. We should be returning to the good old U. S. A. in June of next year. On or about the 15th of that month, my son Basil will be graduating from the American Academy here in Athens. He plans to enter (or rather wants to attend) preferably M.I.T. or the U. S. Naval Academy. My other son, George, age 24, married, lives near you in Cambridge, Mass. He's a graduate student at Harvard University." ... With the deepest sorrow we report the death of two classmates: **James P. Mitchell** of the Army Chemical Center in Maryland, who died December 20, 1967; and **Wesleyan Watson** of Pontiac, Mich., on December 22, 1966. Wes was formerly with the Fisher Body Division. He left his wife Margaret, two children and two grandchildren.—**H. S. Swartz**, Secretary, Construction Publishing Company, Inc., 27 Muzzey Street, Lexington, Mass. 02173

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We have a news release about the retirement March 31 of **Jacob G. Mark** as Vice President, Research and Development, of W. R. Grace and Company's Dewey and Almy Chemical Division in Cambridge, Mass. Jacob is an authority on high polymer chemistry and has had an impressive career at Dewey and Almy since joining the company in 1934 to work on dispersing agents and chemical grinding aids. In 1939 he was appointed Assistant Director of Research and was responsible for directing a program which led to the company's construction in 1942 of the country's first privately-financed synthetic rubber plant. From 1943 to 1945, he served as Consultant to the war-time Office of the Rubber Director, and in 1947 he acted as Field Investigator for the Department of Commerce, where he evaluated developments in German high polymer chemistry. His broadened acquaintanceships among chemists in both Europe and America led to his later organization of the company's Zurich (Switzerland) research laboratory. Dr. Mark has been granted numerous patents and has written technical articles and addressed professional societies.



John J. Hartz, '28



Jacob G. Mark, '29

His memberships include the American Chemical Society, the Society of the Plastics Industry, the American Society for Testing and Materials, and the Industrial Research Institute. He is a company member of the National Association of Manufacturers and is a member of its Committee for Research and Nuclear Energy. He is listed in *Who's Who in the East, American Men of Science, Leaders in American Science, and Poor's Register of Directors and Executives*. He has been Vice President, Research and Development, since 1960, and after retirement will continue to devote a portion of his time to the company in an advisory and consultative capacity. In his private life, Dr. Mark is prominent in various church activities, serving as president and director of several church-affiliated organizations. He and his wife, the former Hazel Pickering, live in Chestnut Hill, Mass. They have four children.

We are sorry to report the news of the death of two of our classmates. **Jen Chieh Huang** died February 27, 1968, in Taipei, Taiwan, where he devoted his life's work to developing industry in China. He was associated with the Cyanamid Taiwan Corporation, a subsidiary of American Cyanamid Company. ... **Edward Martin** of Westfield, N.J., passed away November 19, 1967. We extend our sympathy to the families of these men. ... This brings us to the end of another year of class reporting, but we want to leave a few thoughts with you for your review during your summertime leisure. First of all, our 40th Reunion is only a year away, so please mark your calendars accordingly. Ken Brock reports that as of May 3 we have reached the \$253,121 figure in our goal of \$625,000 for our Reunion Gift—it looks like the fullest co-operation from all is needed if we are to achieve our goal. And, now, another plea from your Secretary for a short note to bring us up to date on your latest activities and accomplishments. Have a wonderful summer! Best regards.—**John P. Rich**, Secretary, P. O. Box 503, Nashua, N. H. 03060

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One of the rather intriguing techniques used by publicists is that of restricting the definition of a category in order to permit the accurate use of a superlative characterization. Using this technique, I may say that we had a 100 percent return of information forms sent out last month to those whose names begin with the letters "Mor." ... Since 1950, **Willard Morain** has been Staff Engineer, R. and D., for Cooper Bessemer Division of Cooper Industries in Mt. Vernon, Ohio. His hobbies are indicated by his membership in the Ohio Gun Collectors Association, the American Numismatic Association, the National Association of Watch and Clock Collectors, the American Radio Relay League (WBWWU) and the Ohio Historical Society. Willard reports that his first wife died last year and that he has recently

remarried. His older son Richard, now a U.S.A.F. Captain, and older daughter Susan graduated from Otterbein College. Son William is a senior at Otterbein and daughter Julie is in high school. . . . **John Moriarty** is a Senior Engineering Specialist with Gulf Oil in Port Arthur, Texas. He has been with Gulf since 1935 and has been continuously concerned with electrical problems. John says Gulf's Port Arthur Refinery is "one of the world's largest—covering six square miles. We generate our own power and have no tie with a utility. I am also involved from time to time on electrical design problems for other Gulf plants—recently Spain, Korea and Venice, La. In past years I have made several pleasant trips to our Caribbean Refinery at San Juan, P. R." John owns a piece of river bottom wilderness in Beauregard Parish, La., which provides duck, goose and deer hunting in the fall and both salt and fresh water fishing all year. He has just bought a Ford pickup truck and is installing a "camper" with overhead canoe rack in the truck body to "broaden my outdoor activities." The Moriarty's have two children: John David, who received a B.S. in journalism from the University of Texas and is now on the City Desk of the Beaumont *Enterprise*; and Gail, who plans to enter the University of Texas next fall and major in English and music. John reports that he sees **Norwood Kenney** from time to time and that he is planning to come to the 40th Reunion.

Gerry Morse is a Vice President of Honeywell, Inc., with corporate-wide responsibility for employee relations. Gerry's list of public service jobs is so extensive that it is difficult to figure out how he has any time left for Honeywell. In addition to those previously listed in the June, 1963, notes, he is a member, by presidential appointment, of the National Labor-Management Panel and, by gubernatorial appointment, of the Advisory Councils of the Minnesota Commissioner of Employment Security and Commissioner of Human Rights; a faculty member of the Columbia University Seminar on Technology and Social Change; Director of the Greater Twin-City Safety Council; Chairman of the Industrial Relations Committee of the National Electrical Manufacturers Association; and a member of the M.I.T. National Nominating Committee. The complete list comprises 20 items. How do you do it, Gerry? . . . **Jim Morton** is another classmate who believes in the active life. In addition to his principal job as Vice President, Administration, Loomis, Sayles and Company, Inc., he is Vice President and Director of the Loomis-Sayles Capital Development and Canadian and International Funds; Director of the Loomis, Sayles Mutual Fund; Commissioner of the Public Works Department, Town of Wellesley; Trustee and Member of the Corporation of Northeastern University; and Trustee of the Newton-Wellesley Hospital. . . . **Horace Myers** has deserted Honolulu after 17 years residence there and settled in Tampa, Fla., where he is engaged in

lighting sales work for Atlas Electric Supplies. . . . As many of you know, for a number of years **George Nakashima** has had a studio at New Hope, Pa., where he designs and fabricates some very interesting hand-crafted furniture. Apparently George's business is booming. He now has branch operations in Takamatsu, Japan, and Ahmedabad, Gujarat, India. He recently had an exhibition of his furniture in Tokyo. Under the heading of "hobbies" George lists "building monasteries." The Nakashimas have two children: daughter Mira, who graduated from Radcliffe, took graduate work at Waseda University in Japan, is married and has two children, Satoru and Maria Amagasu; and son Kevin, who attends Buckingham Friends School.

This month we received news that three more of our classmates have passed away. **William Murrar** died at Norfolk, Va., on October 16, 1967—unfortunately no details are presently available. . . . **Arne Gudheim** died at Petersham, Mass., on February 9, 1968. After leaving M.I.T. Arne worked for Lever Brothers in Cambridge for 17 years, after which he was Manager of the Process Equipment Division of Rodney Hunt Company of Orange for a number of years. At the time of his death he was President of Kontro Company, a manufacturer of food and chemical processing equipment. He is survived by his wife Nan, a son Arne, Jr., and a daughter Mrs. Sigrid Thompson. . . . **Charley Edlund** died at Lowell, Mass., on March 25, 1968. After graduating with us in 1930, Charley obtained an M.A. at Harvard and did graduate work at Columbia, the University of Chicago and the University of Paris. During the fifties he was Dean of Lowell Technological Institute, but for the last eight years he had been retired. He was very active in Masonry, a past Master of Kilwinning Lodge, A.F. and A.M. of Lowell, a past High Priest of Mt. Horeb Royal Arah Chapter; holder of the York Cross of Honour; a member of the Aleppo Temple, Order of the Mystic Shrine of Boston; and a member of the Advisory Board, Lowell Chapter, Order of De Molay. He is survived by his wife Cristobal. . . . Changes of address: **Holland W. Hamilton**, 214 Horner Street, Belen, N. M. 87002; **Edward M. Pritchard**, 16 Heathcliff Road, Rumson, N. J. 07770; **Allan H. Stone**, Stonehaven Rt. 2, Elkhart Lake, Wis.; **George F. Wyman**, 715 Amherst Circle, Ashtabula, Ohio 44004; **Horace W. Myers**, 3941 Fontainebleau Drive, Tampa, Fla. 33614.—**Gordon K. Lister**, Secretary, 530 Fifth Avenue, New York, N. Y. 10036

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A note from **Madeline I. Anderson** reports: "I'm always sorry I can't contribute more. Thank you for sending the *Technology Review*. I keep them a year so I can reread them and show them to the pupils I tutor. Have been retired from teaching math at Brookline High School 10 years (1958)." . . . **Bill**

Dodge reports that he is now General Manager of a new Corporate Research Center being built in Sterling Forest, N.Y., by International Paper Company. . . . After 10 years of planning of medical research functional areas for the Veterans Administration, **Bob Fulton** is now head of a group which does the planning, programming and budgeting for the construction of new V.A. hospitals and the modernization of the older ones. His address is 3316 Wraywood Place, Falls Church, Va. 22042. . . . During one of my recent ham radio schedules with **Fred Elser** (W6FB), he told me that he is planning to have a family get-together this year and hopes to be able to visit the East again next year. Mardy, Fred's wife, is still going great guns at bridge. . . . **Lou Evans** has completed 30 years of "exciting" service with Mobil Oil Company—Research Department—in Paulsboro, N. J. During World War II he served on special technical intelligence missions in Germany relative to synthetic fuels production, was active in developing catalytic cracking technology, along with other oil refining processes for Mobil. Lou is now running technical training programs for several hundred Mobil engineers. Among Lou's hobbies are skiing, chess and singing. He is married, has a daughter 23 and son 25.

Our Class was well represented at the 20th M.I.T. Fiesta in Mexico this year by the Knapps, Kalmans and Richardsons. **Stu Knapp** wrote that the memories of this occasion and the hospitality of the Mexican Club members will be with him and his wife for a long time. . . . A recent release tells of **Ken Germeshausen's** gift of \$600,000 to endow a Germeshausen Professorship at M.I.T. Ken is Chairman of the Board of E.G. and G., Inc. The professorship, undesignated as to academic department, is intended to support M.I.T.'s strong interest in combining humanitarian advance with technological progress. Ken is the inventor of the strobotron and the hydrogen-thyratron and the holder of over 50 patents. . . . My face is red! Several (or should I say many) months ago I received a nice note from **Ed Hubbard** and Charlotte sending greetings from their new house on 230 Highland Street, Weston, Mass. It's a federal style, two story hip-roofed affair with a wide central hall—their dream house. They have grandchildren in Portland, Ore., as well as in Weston. Good luck to both of you, Ed and Charlotte. . . . **Bill Jacobs** is busy making plans for our 40th Reunion Gift—which has gotten off to such a good start with Ken Germeshausen's gift—and your Committee hopes that we'll be the first Class to achieve 100 percent participation by all class members. . . . A thoughtful note from **Fred Nordsiek** tells of his appointment as Adjunct Professor of Public Health Nutrition in Columbia University, effective January 1, 1968. Fred continues as Coordinator of Research at St. Luke's Hospital Center, N. Y. . . . Regrettably, I report the death of two of our classmates, **Arthur Seelye** and **Frederick G. Suhr**. Arthur passed away on March 24.

He was a graduate of Deerfield Academy and Bowdoin College as well as M.I.T. Frederick died on January 10, 1968. Our deepest sympathy to both families.—**Edwin S. Worden**, Secretary, 35 Minute Man Hill, Westport, Conn. 06880

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To conclude this year of class news on a happy note we report the marriage of Professor **Raymond K. Flege**, Course X, to Mrs. Mildred E. Patat on December 18, 1967. Raymond is Professor of Textile Engineering at the Georgia Institute of Technology. Their home is at 219 West Paces Ferry Road, N.W., Atlanta, Ga. 30305. Congratulations.

... In a letter postmarked Tokyo, Abbott Johnson, '22, wrote to his Class Secretary in March that he was on a 93-day cruise of the South Seas and the Orient. He wrote that there were five other M.I.T. graduates aboard including **Joseph Tomlinson** and his wife with others from Classes of '17, '22, '27 and '57. That's the place to have a reunion. ... Professor **Rolf Eliassen** of Stanford University has been appointed a member of the panel from which the A.E.C. selects Atomic Safety and Licensing Boards. The Commission has been gradually expanding the panel in view of the increasing number of applications for permits to construct nuclear power plants. The principal function of the Boards is to conduct public hearings and to make initial decisions on applications to construct nuclear power plants.—**Elwood W. Schafer**, Secretary, M.I.T., Room 13-2145, Cambridge, Mass. 02139

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The Review Office recently received the following information published in *The Novacrat*, the official publication of Nova University, Ft. Lauderdale, Fla. "**Warren Henderson** and James R. Killian, Jr. ('26) Chairman of the Corporation of Massachusetts Institute of Technology and a member of the famed Nova University Advisory Board, are proud graduates of the same school—M.I.T. Warren's full-time hobbies, or occupations, are as an Angus Cattle breeder and member of livestock associations, and as a most active Secretary of his M.I.T. Class of 1933. He and Mrs. Henderson, his Leona, spend their winters on Hillsboro Beach, Pompano Beach, and summers at Fort Rock Farm, Exeter, N. H. He and Nova's Trustee Board Chairman, James Farquhar, are long-time friends and have much in common in their interest in the production of fine Angus Cattle. Henderson is a member of the Union Club, Cleveland; Hundred Clubs of Broward and New Hampshire; the Royal Palm Yacht and Country Club, Boca Raton; and Boca Raton Hotel and Club." (the Editors)

The lead-off man this time is **Walter Duncan** who lives in the Philadelphia section of Wynnwood, Pa. Walt writes:

"Except for **Bill Baur**, **Beau Whitton** is the only classmate who has tried to reach me recently. He finally succeeded. About a month ago Beau came to see us with his son Robert, who is doing graduate work in math at Penn." Walt has three children: Susan, H. Scott, and Bruce. Susan went to Wellesley (as did her mother). She was married right after graduation and now has three children. Scott went to Dickinson and then served as an Army officer. After this he joined the Peace Corps and served as a volunteer in Thailand. His wife, who was also a member of the Peace Corps, accompanied him. He returned to the United States for a year on the Thai desk in Washington, then returned to Thailand for another two years as Deputy Representative of Volunteers. Scott and his wife are now at the University of Hawaii in Hilo where he is directing a Peace Corps training program for Thailand. They have two children, ages two and four, both born in Thailand. Bruce is Walt's youngest. He went to Exeter (as did his father) and then to Williams. He spent his junior year at the University of Munich. After his graduation from Williams, Bruce attended Cornell for two years then studied at the University of Berlin for a year before returning to Cornell to finish work for his Ph.D. in German. Bruce married a girl from Dedham, Mass., whom he met in Munich. Walt has been with Proctor and Schwartz, Inc., suppliers of finishing equipment. This work involves quite a bit of travel. Walt is President of the Valley Forge Council of Boy Scouts, an organization with 33,000 members. He comments: "If anyone thinks ill of today's young men he ought to get into scouting and get re-oriented." Jane and Walt are well and enjoying life as much as ever and, Walt, we all wish that you will for many, many years.

Bill Brothwell, along with Win and Westy, is still a bachelor. Bill writes that he is seeking another business or research connection. He has been working out of Torrington this winter. Bill is in great shape, but says that his mother suffers a great deal from arthritis. She is 88. ... We have a nice note signed by **Calvin Mohr** and Jean full of advice on the class officer situation. Cal reports that **Otto Putnam** is considering going back to work, although we have no details as to when and where. Cal also tells us some sad news—**Adam Sysko** has suffered a rather serious leg break, one that required mechanical pinning to fix. Why not send Adam a card to help him pass the long days of inactivity? His address is 40 Delaware Avenue, Pennsgrove, N.J. 08069. We are thinking of you, Adam, and hope that your leg will soon permit you to return to your golf. ... From Niantic, Conn., comes a note from **J. Dyer Potter**. He and Edythe have been married for 31 years. They breed and show American and Canadian champion A.S.C.O.B. cocker spaniels. Jay allows that the hobby is a money loser, but he doesn't mind. The Potters spend a month in

Florida last winter, and some time on Treasure Cay, Bahamas, where they have had a piece of property for several years. Jay has been with the Connecticut Highway Department for 35 years, and he plans to retire in 1970. He served 3½ years in the South Pacific during W.W. II, and 18 years with the Corps of Engineers, from which he retired in 1963. Jay is another lover of Mexico, having spent almost three months in Monterrey, Mexico City and Vera Cruz several years ago. Many, many thanks for the news, Jay.

Some of our classmates are quite interested in ham radios and have asked me to mention this subject. Those who have done some ham work are: Frank Bleil, Steve Crick, Ernesto De Sola, Clarence Farr, Don Fink, Dick Fossett, John Longley, Horace McKechnie, John Maxim, Dick Morse and Robert F. Way. If anyone wishes to have their call signals I will mail them upon request. No doubt there are others—this is a popular hobby. I have a good Hallicrafters receiver but have no transmitter. ... We had a short note from **Alex Nichiporuk** who has moved to Arlington from Cambridge, Mass. ... **Bob Tripp** wrote us about his family. His daughter Dorothy is married to Harvey Kelly and has three children. His son Robert has a Ph.D. in biological psychology from Duke and is working in the Boston area. His son William has a B.S. in business from Syracuse and is working in market research. Bill is married to Janette Gold. His son John is stationed with the U.S. Army, SP5, in Okinawa. Bob loves to travel—recently the Tripps visited John and his wife Priscilla in Okinawa and then went on to Japan, Hong Kong and Singapore. They have also been to South America, Alaska, Hawaii, the Greek Islands and most of Europe.

L. Hart Cirker has a unique way of naming his children—numbers! He writes: "Boy number one is in graduate school at the University of Mainz, Germany; boy number two is at Wilmington College; and boy number three is in junior high school. The Cirkers have traveled all over northern Europe and visited many places in the United States and Canada. L. H. is interested in photography, gardening, and music and music systems. They are active in the Unitarian Church, and L. H. is also involved in Boy Scout work. ... **Bill Pleasants** is working for Westinghouse Atomic Power Division at Indian Point, N.Y. ... **S. Alvin Bell** received the Ironmakers Award for 1968 from the Metallurgical Society of the Mining, Metallurgical and Petroleum Engineers. The award was given at the Ironmakers Conference on April 2, 1968, in Atlantic City. Al is Senior Research Engineer at A.R.M.C.O.'s Research Center in Middletown, Ohio. Our congratulations, Al. ... **George Ropes** writes: "Will be at M.I.T. this weekend (April 19), as I am invited to participate in a weekend sponsored by the Undergraduate Association to show us old

fellows what life is like at the Institute these days. Still hell, no doubt."

We have received a fine letter from **Thomas Fitz Patrick**, former Dean of Architecture at the University of Virginia. Tom received a federal research grant fellowship for 1967-68, to make a special study of the most advanced acute care hospitals and rehabilitation centers in the country. This has involved over 10,000 miles of travel and carrying out on-site evaluations and observations. Tom says: "It has been an enormously interesting experience because of the fact that the entire field of medical and health care is now undergoing some really fundamental changes, and, after completing this work, I hope to produce a really useful publication on it just as soon as possible." In late February Tom was vacationing in Mexico and, unfortunately, tore up the whole front tendon of his right foot. So now he is grounded and is staying in his North Carolina home, Calico Hill (Box 387, Highlands, N.C.). Tom would enjoy hearing from any Course IV men, especially **Gordon Bunshaft** and **Bob Mills**. All of the Fitz Patrick boys have now finished college. Kevin, the youngest, is working in the theater, technical directing with A.P.A. Phoenix on Broadway. Pete is working with his Tros-Dale Home for Boys, and is about to open another unit in Orange, Va. Bill is in Colorado experimenting in breeding, crossing Polled Herefords (hornless) with Chatolais. Tom has been made a member of Phi Beta Kappa. This is quite an honor. Congratulations, Tom.

Because this issue follows the 35th Reunion of the Class of 1933, we are starting a new effort to help you get to know the officers of the Class. Our new President **Jim Turner** is no stranger, but how many of you knew that Jim spent two extra years at Harvard Business School after graduating from M.I.T. in Course XV? After finishing at Harvard, Jim entered the accounting field and spent three years in New York City as an "apprentice," and then a year with the American Smelting Company in the General Accounting Department. After these experiences, Jim was able to pass the New York State C.P.A. He worked with the Foreign Department at Colgate-Palmolive, and then went with his present firm, Talon, Inc. Jim became Treasurer of Talon in 1944, Vice President in 1947, and a Director in 1958. Jim's civic work is both interesting and diversified. He has been President of the Chamber of Commerce, Director of the National Association of Manufacturers, Director of Meadville City Hospital, Director of the Meadville Area School Authority, Director of the Merchants Banks and Trust Company, and a Director and former President of the Meadville Community Hotel, Inc. (a million dollar civic effort managed by the Treadway Inns Corporation). Jim and his wife Edna were married in 1935 after she graduated from Skidmore and he had finished at

Harvard. The Turners have two boys, A. Richard and David. A. Richard is with International Harvester and has been married over two years. David was married last August and is working in Boston with John Hancock. Jim is quite involved with work at M.I.T. With Jim at the helm, the Bob Kimball Scholarship Fund was able to raise \$50,000 in a short time, for several years he has been on the M.I.T. Educational Council.

Calvin Mohr has been Vice President of our Class since 1953. Cal is a chemical engineer who has held many interesting positions. At present he is with D.R. Sperry and Company, North Aurora, Ill. He has worked for M.I.T. serving on innumerable committees, funds and drives. Cal writes: "My hobbies are gardening and 'do-it-yourself' household repairs on our home. Of course, Jean pitches right in too." He is a member of the Episcopal Church and is active in many church affairs including adult education, choir, vestry, and lay reader activities. He belongs to the American Institute of Chemical Engineers, the Chemical Equipment Sales Engineers Association of Chicago, the American Chemical Society and the Filtration Society. Cal, your classmates appreciate the work you have been doing for the Class of 1933.

Another newly elected Vice President is **Fred Murphy**. Fred has been with Standard Plastics since graduation, and is President of the company. He lives in Attleboro, Mass., and is very active in civic affairs. He is a Trustee of the Attleboro Public Library, and officer in the Community Fund, and officer in the Y.M.C.A., and has been Commander of the Attleboro Power Squadron. He is a member of the Lions, Elks, and the Knights of Columbus. Fred and his wife Anna are the proud parents of seven children. His hobbies are sailing, navigation, skiing and photography.

Clarence Westway is next. Westy worked his way around the world in 1933 via freighter. He was with the Boston Consolidated Gas for three years and then went with Ingersoll-Rand where he is now Manager of Sales, Utility Division. Westy is interested in golf and photography.

Our West Coast man is **William Rand** of Bakersfield, Calif. Bill is Manager of Real Estate for the Kern County Land Company, whose holdings are twice the size of Rhode Island, 2,000,000 acres! His principal activity at present is land development in and around Bakersfield, and a redevelopment project in Santa Monica. Bill and his wife Jean were married in 1934 and have two children, Lindsay and Pete. Lindsay, who is living in Los Angeles, is married and has two children, David (5) and Hilary (3). Pete graduated from the University of the Pacific and works in the County Welfare Department in Bakersfield. . . . The next notes will appear in the October/November issue of the *Review*. Write to your Secretary so we can have news of you.—**Warren J. Henderson**, Fort Rock Farm, Drawer H, Exeter, N.H. 03833

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Johnny Hrones, has accepted the position of Study Director of the Requirements for Information Systems in Education for one year starting April 1, 1968. This project is sponsored by Associated Universities, Inc., an independent, non-profit research management organization established in 1947 by nine sponsoring universities in the east including M.I.T., Harvard, Yale and Columbia. Johnny is on leave of absence for one year from Case Western Reserve University where he is Provost for Science and Technology. The study is related to the use of systems analysis, computer technology and new methods of handling information as



Ivan Getting, '33 (right), President of Aerospace Corporation, visited the MITRE Corporation recently to explore areas of possible technical interaction between the two organizations. Dr. Getting is pictured discussing this project with Dr. John L. McLucas (left) of MITRE.

related to the university. . . . **Sam Joroff** has been appointed Chief of Planning for Staten Island in the office of the Mayor of New York City. . . . **Don Lister** was recently named Vice President of the Chemical Bank New York Trust Company. Don is responsible for research and planning in the Personnel Division. He joined the Corn Exchange Bank in 1934, was promoted to Assistant Manager in 1941 and to Assistant Secretary in 1949. In 1954 when the Corn Exchange merged with the Chemical Bank, he was made Assistant Personnel Director and became Assistant Vice President in 1963. Don was a line officer in the Naval Reserve in World War II, received a Bronze Star with combat "V" and is currently a Commander in the Naval Reserve. He is also Vice Chairman of the Business Education Commission, which is affiliated with the New York City Board of Education.

Ted Graves, who graduated with us in '34, in a letter to George Bull wrote: "I am naturally rather out of touch with the Class of 1934 at M.I.T. as I really belong to the Class of 1922 at Harvard. You see, I came to M.I.T. in the depression years when my business was in a slump. I took some graduate courses and assisted Professor John Norton in his classes in x-ray metallography until 1936. I imagine I was on the books as a member of the Class of '34 because one of my graduate courses required an undergraduate pre-requisite that I had not taken at Harvard. Since leaving M.I.T. in 1936, I became Chief Engineer of a Thermostat Company in New Jersey and retired in 1956 and moved down to Maryland where I have been designing yachts and have had several sail boats built which I charter to experienced sailors in the summer." . . . **Dick Sanders** writes: "Entered in Class of '35 but with summer school and previous schooling, graduated in Class of '34, Course II. With my brother Bob ('31), have kept a small Aircraft Operation going (Sanders Aviation Company). Have been to at least three reunions, including one or more that you attended. Have contributed every year (probably missed some after graduation so this is an overstatement) to Alumni Fund. Alumni Association has my home address: Box 262, Route 1, Annapolis, Md. 21401—moved here July, 1966, from Utah Avenue, N.W., Washington, D.C. Have two children Steve (Stephen) who did not graduate from college and a daughter Lynn (Connecticut College, New London, Class of '64) who did. She is now married and is expecting her first child this summer. Steve is not married and has no children, that is as far as we know. Steve is now trying to make commercial movies but so far has not hit the combination. Though we travel quite a bit, Jean and I are home in Annapolis (actually outside of the city near town of Riva) quite a bit. Phone is 263-3186 if you get down this way." . . . From Silver Spring, Md., **Bernie Gilbert** says: "I've been working in the D.C.



Donald K. Lister, '34

area since the beginning of 1941, and have been living at my present address since 1954. There are a number of M.I.T. alumni at the Naval Ordnance Laboratory, where I work, but none of them were students there at the same time that we were. Actually, I know of only two classmates in the area, **Carleton Davis** and **Harry Fine**, both of whom were in VI-C. I was in VI, myself. I turned in a personal history for our 25th Reunion, which I attended, but haven't sent in any more recent information. Since then, my two daughters have grown-up. Judy graduated with honors from Chatham College in Pittsburgh last year and married a fellow from Pittsburgh, Samuel A. Livingston, this January. They now live in Baltimore, where her husband is a research assistant at Johns Hopkins, and she works as a computer programmer. My other daughter, Rachel, is a senior at the University of Maryland.

"I'm still working at N.O.L., where I'm Chief of the Data Acquisition Laboratory. My wife had been working as a special teacher in the D.C. School system recently, but she had a heart attack last summer and is still recuperating from it. We took a trip abroad in 1964, in celebration of our 25th wedding anniversary, and are looking forward to more travel when my wife's health will permit it again. Other than that, my main hobbies have been photography and home maintenance projects. I'm interested in learning of other Class of '34 members living in the vicinity. I can be reached on the phone nearly any evening at 942-8471."

John Barrett reports: "Dear George, I got your letter of April 12 but have hesitated to answer it because I've done one heck of a lot of things since graduating from M.I.T. in 1934 in Course III-4, and I didn't want to bore you with the details. However, I'll make it as brief as I can: July, 1934, to January, 1936, American Manganese Steel Company, Chicago Heights, Ill.; January, 1936, to May, 1940, G.E. Company, River Works, Lynn, Mass.; May, 1940, to June, 1942,

Baldwin Locomotive Works, Eddystone, Pa.; June, 1942, to July, 1945, Taylor-Winfield Corporation, Warren, Ohio; July, 1945, to June, 1950, G. L. Martin Company, Baltimore, Md.; June, 1950, to July, 1952, Military Security Board, Foreign Service, U.S. State Department, Berlin and Koblenz, Germany; August, 1952, to July, 1955, U.S. Bureau of Mines, College Park, Md.; July, 1955, to present Office of Director Defense Research and Engineering, Office of Secretary of Defense. All my jobs up to the last have been in metallurgical R. and D. except the German one, which consisted of controlling (together with an Englishman and a Frenchman) the German steel industry according to the reparations laws. My present position is a management type; I coordinate the materials R. and D. programs of the three military services.

"In 1966 my industrial and governmental service periods crossed over at 16 years each. I don't expect to move any longer, but to retire in about 10 years from my present position. I married for the first time in 1938, and have a son and a granddaughter from that union. In 1954 my wife died of leukemia, and I married again in 1957 and started a new family—three boys, aged 9, 8, and 6 respectively. I'm kind of old for that stuff, particularly since they'll be piling into college (God willing) just as I retire. I guess I'll just have to keep working. My hobbies, outside of tennis (which I still indulge in) are resting and reading. That's the story—I hope I haven't been too long about it."

John C. Hawkins was promoted to Manager of the recently formed Industry Marketing Department at the Foxboro Company. He joined Foxboro in 1948 and was recently Branch Manager at Wilmington, Del. . . . **Gil Lorenz** tells us: "Present job: Director, Mapping and Geographic Sciences Laboratory, U.S. Laboratory, U.S. Army Engineer Topographic Laboratories, Ft. Belvoir, Va. Son Gil, who graduated from University of North Carolina, in 1963, is married and living in Ashville, N.C. Daughter Julie, who graduated from Miami University (Ohio) in 1966, is living in Washington, D.C. Gave papers on 'Automation in Photogrammetry' at British Commonwealth Surveyors Conference in Cambridge in August and spent three weeks touring British Isles with wife, Thelma." . . . In a note from **Charles Wesley** of Cedar Road, Bethany, Conn. 02525: "Our children are on three different continents: David is doing field engineering in Copenhagen, Margo is doing social work in Chicago (she took her master's at North Western, then taught in Scotland), and Alfred is in Ghana with the Peace Corps."—**George G. Bull**, Assistant Secretary, Mid-Atlantic, 4961 Allan Road, Washington, D.C. 20016; **James Eder**, Secretary, 1 Lockwood Road, Riverside, Conn.; **Norman B. Krim**, Secretary, 15 Fox Lane, Newton, Mass. 02159; **W. Olmstead Wright**, Secretary, 1003 Howard Street, Wheaton, Ill. 60187

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After last month's complete dearth of news, we received several items for this issue. . . . **Chester Bond** writes: "Still constructing for the institutions and industries, including our own Technology, especially the utilities to our new buildings and the new dormitory on the Drive; also the newest building at Harvard Business School for International Studies. Had a wedding in our garden for oldest child, Ellen, this summer to a boy, son of another Tech man, Joe Kene, '33. My son is now with I.B.M.". . . A note from **Morton I. Weinberg** says that he had spent 28 years in aeronautical engineering before becoming involved in surface traffic and transportation. He is now Head of the Transportation Systems Section in the Cornell Aeronautical Laboratory. His family consists of his wife, the former Sue Ann Snyder, whom he married in December of 1940; David, 25 years old, M.P.A. Cornell University, 1967; Bernard, 22, B.A. Syracuse University, 1967; and Lora, 20, a third year linguists student at Harpur College.

A note from Harold C. Pearson, '23, for the Fiesta Committee 1968, M.I.T. Club of Mexico City, relayed via **Ham Dow**, reported that **Bernie Nelson** and his wife, Rhoda, showed up for the 20th Annual Fiesta in March. . . . Ham's letter tells of a weekend visit from **Allan Mowatt** and also of a telephone call from **Don Gutleben**. Don is still with O. and H. Sugar Company, who purchased the Spreckels Refinery in Crockett, Calif., where he started in 1935. Don lives in Alamo, Calif., with his wife, has one daughter in college and one married. Don appeals through this column for news of **Dave Dale**. How about obliging, Dave? . . . **Robert D. Richtmyer** has just co-authored the second edition of a book entitled *Difference Methods for Initial-Value Problems* published by Interscience Division of Wiley. . . . **Edward C. Edgar** has just co-authored an article in *Public Utilities Fortnightly* entitled "System Growth and Obsolescence-Effect on Depreciation." Ed is Manager of Economic Engineering Division of Gilbert Associates and Director of the company. . . . **Frank J. Lord**, Treasurer of the Polaroid Corporation, has been elected to the Board of Directors of the Newton-Waltham Bank and Trust Company. —**Phoenix N. Dangel**, Co-Secretary, 329 Park Street, West Roxbury, Mass. 02132; **Irving S. Banquer**, Co-Secretary, 20 Gordon Road, Waban, Mass. 02168

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A little bird has informed us that **Norm Copeland** and Gladys attended the 20th Annual Fiesta of the M.I.T. Club of Mexico City. . . . The **Bill Cresswells** traveled to the South Pacific and Orient this spring. . . . **Charles Milone** has been named Director of Research and General Products Development at

Goodyear Tire and Rubber. . . . **Pete Weinert** has been appointed Director of Technical Services for Universal Oil Products Process Division. He's been with U.O.P. since 1936! . . . **Ben Fogler** writes that he has been elected Trustee of the Lexington (Mass. natch!) Savings Bank and is a proud grandfather of three. . . . **Hamilton Migel**, after several years in London, is now in Chicago as Vice President, Medical Division, of Maganflux Corporation. The firm develops and markets ultrasonic instruments and systems for medical diagnostic applications. . . . While you are all enjoying summer vacations now about sending your Secretary a newsy postcard?—**Alice H. Kimball**, Secretary, 20 Everett Avenue, Winchester, Mass. 01890

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Phil Dreissigacker is Chief Engineer at Farrel Corporation, Ansonia, Conn. He is High School Father's club officer, Vestryman and Planning Committee Chairman for his church. One son is a junior at Brown and the second a junior in high school. . . . **Bob deRaimes** is Assistant to the Vice President of Manufacturing at Peter Paul, Inc. He will be working in the Netherlands part of the time and eventually moving to Connecticut. His oldest daughter, Jannine, is a math major at Purdue University and his second daughter, Beverly, is a deaf education major at Ball State University. . . . **Robert Vahlberg** of Oklahoma City, Okla., will represent the Institute at the Inauguration of Robert L. Martin as President of the Oklahoma College of Liberal Arts.

Jim McLean has recently been named General Manager of Hurst-Airheart, Inc., in Van Nuys, Calif. . . . **Al Schroeder** of R.C.A. Laboratories, Princeton, N.J., recently addressed the 1968 International Convention and Exhibition of The Institute of Electrical and Electronics Engineers, Inc., held in New York City.

Dick Young announces that his youngest son, Stephen, was married this spring. He writes that he had just attended, with Ruth and **Phil Peters**, the wedding of **Art Hunt's** daughter. Dick also saw **Wayne Pierce**, who for many years has been partner in business with Art Hunt. Dick, as you know, is our Reunion Committee Chairman, and has been working on a location for a Class Reunion this fall. You will receive a notice on the Reunion and we hope you and your wife will plan to attend. This should be a fun time and will be a chance to see our classmates and renew friendships. The fall get-together plans have just been finalized for Jug End Inn, South Edremont, Mass. (close to Great Barrington), September 21-22. This location has been selected since it is a half-way point between Boston and New York City.—**Robert H. Thorson**, 506 Riverside Ave., Medford, Mass. 02155. Professor **Curt Powell**, Assistant Secretary, Rm. 5-325, M.I.T.

Cambridge, Mass. 02142; **Jerome Salny**, Assistant Secretary, Egbert Hill, Morristown, N.J.

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Reunion and Alumni Day coverage in this issue offers red-hot class news on almost every page! My opportunity this month is limited to supplementary tid-bits—as our Reunion Committee comes breathing hard down around the elbow of the Cape! Expectations of another sort are also running high, as a rather high incidence of sibling marriages looms. . . . "I find now that I myself cannot make the Reunion," confesses Publicity Chairman **Paul Black!** "My oldest boy Peter is getting married on June 8 in Miami, and I once again need the secret of how to be in two places at the same time." . . . **Ross Cooper** reports: "Will be sorry to miss the Reunion festivities (and maybe the chance to break it up for some of you), but daughter Julie is being married on June 8. We will be having a reception at home in Beverly Farms (Mass.) that afternoon." . . . "My daughter Barbara is graduating from Carleton College in Minnesota on June 7," **Fred Ray** has written, "and we won't be back to New York until June 10. Hate to miss the 30th since we've attended 10th, 15th, 20th, and 25th. We'll aim for the 35th!" . . . Not requiring quite so much traveling is **Al Wilson's** problem: "Our daughter Sarah is graduating from Lasell on Reunion weekend, so that Carol and I will have to be away after lunch on Saturday. . . and rejoin you Sunday evening at M.I.T." . . . "My wife Gerry has her 25th at Radcliffe this June," reports **Dave Morse**, "so as of now we are working out the details of a split shift. Will try to spend Saturday at Chatham Bars and stay for the clambake." . . . **T. Y. Shen's** problem is even more disrupting. "I am very sorry that I shall not be able to attend the 30th Reunion this June. My job is being transferred to Taipei, Taiwan, and I am moving my family over in early May. May I wish everyone at the Reunion a wonderful time. If any of you should be coming to Taipei in the next few years, please contact me at Lien Chen Limited."

King Coombs reports: "Still working for G.E. in Wyoming, Ohio, in design of jet engine structures. Haven't seen any classmates since **Jack Chapin** dropped in a couple of summers ago. Looking forward to my first Reunion." . . . "Our activities have not changed much since the 25th," says **Horace Homer**. "Our son is now at Bowdoin College majoring in Russian. I am still active in scouts, politics, technical societies, and Army Reserve. In my spare time I am Chairman of a school addition committee—building an addition to a school designed by **Dave Morse** in Arlington, Mass." . . . **Jim Maguire** says: "I have been Director of Personnel for Monsanto's Central Engineering Division since 1964, when we organized

it to perform all of Monsanto's engineering work both domestic and international. It is a fascinating and absorbing job quite a bit different from manufacturing!" . . . "Life continues to be interesting," reports **Bob Robbins**, "both professionally and personally. During the summer of 1966 my (then) 20-year old daughter Pat and I flew our single engine airplane on a 6-week, 130-hour, 16,000-mile trip down the West Coast of South America to Santiago, to Buenos Aires and up the East Coast and back home to Wichita, Kansas. The following spring my 19-year old son Rob and I took a 10-day island hopping, camping-out flying trip through the Bahamas. Last Christmas our whole family (six of us including our son-in-law and prospective daughter-in-law) took a 10-day vacation in the Bahamas in the same airplane. A week of it was spent on a 33-foot yawl which we chartered in Hope Town. Scuba diving is my most recent hobby!"

"Still at Raytheon," says **Fred Jenks**, "completing 22 years in the Missile System Division—doing system engineering and integration. Two of my three daughters, Darby and Patricia, are married, and we have two granddaughters. Skiing is my number one hobby, and it occupies nearly every weekend during the winter! We are still living in Wayland." . . . **Gif Griffin** has been named General Superintendent of Generation for Public Service Electric and Gas in Newark, N.J. Gif has been with Public Service since 1939 assigned to various stations. In 1964 he was appointed Assistant to the General Superintendent of Generation, and in 1965 Assistant General Superintendent. . . . **Charlie Donlan**, Deputy Director of Langley Research Center, N.A.S.A., has been transferred to N.A.S.A. headquarters and named Deputy Associate Administrator for Manned Flight (technical). Charlie was Associate Director for Development of Project Mercury. . . . **Lloyd Clark** has been elected one of two National Vice Presidents of Consulting Engineers Council of the U.S.—the professional organization of engineers in private practice. Lloyd is a partner of Clark and Groff, Salem, Oregon, specializing in sanitary, civil municipal, and structural engineering. He has been actively involved in North Dakota, Oregon, and Alaska! His son Kimble is studying for a Ph.D. in engineering at Purdue, daughter Mary is a graduate nurse, and the youngest, daughter Ann, is studying at the University of Denver.

Don Severance has shared with us a note from **Clark Robinson**, sent from Novosibirsk, Russia (see the June Notes): "I am not sure that my wife has made the necessary arrangements for us to attend the 30th Reunion. We will be there for sure, but since I will not return to the U.S. until May 29, perhaps you could put our names on the appropriate lists. Just received the April *Technology Review* which you sent. It looks very interesting, and is the kind of thing I don't see here."

I have just received from **Dick Muther** the program for the five-day conference, "Long-Range Planning of Industrial Facilities" for company officers and corporate staff specialists. Dick has arranged this in June at the Mt. Whitney Lodge of the Lake Placid Club—presented by Richard Muther and Associates, Inc. (affiliate of Muther International: Zurich, London, Oslo, Kansas City). . . . Much of the last-minute Reunion news will have to wait for fall. If you've shared some of your experiences and reactions in the Chatham Bars discussions, it will be appearing! But if you were prevented from joining us, look through the pictures in this issue and send us the first 200 words that flash into your mind.—**Frederick J. Kolb, Jr.**, 211 Oakridge Drive, Rochester, N.Y. 14617

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Although **Bill Brewster's** elevation to the chairmanship of United Shoe Machinery Corporation was recorded in the June notes. Did most of you see the excellent write-up on Bill and his company in a recent *Business Week* feature story? . . . Brigadier General **Leo A. Kiley** enters this column regularly, and here is his latest assignment: Leo has assumed command of the Air Force's Office of Aerospace Research (O.A.R.) with headquarters in Arlington, Va. O.A.R. is the agency responsible for planning, programming, and managing the Air Force's basic research program. . . . **Arthur S. Merrow** has been appointed Fuel Engineer for the Lackawanna Plant of Bethlehem Steel Corporation, in Buffalo, N.Y. In addition to his plant duties, Art now finds himself active on the Air and Water pollution Council of the Buffalo Chamber of Commerce, the Water Resources Committee of the Associated Industries of New York State, and the N.Y. State Action for Clean Air Committee. He says he will be busy helping clean things up!

A welcome note from Harold C. Pearson, '23, for the Fiesta Committee of 1968 said that **Dave Bartlett** and **Irving Peskoe** and Beatrice enjoyed the festivities in Mexico City in March. . . . Lieutenant Governor of Massachusetts **Francis W. Sargent** has been making the headlines in Boston papers frequently with favorable accounts of his capabilities in that office. A columnist in the Boston *Herald Traveler* says that Frank is rapidly being transformed into a favorite



Lloyd K. Clark, '38



Clare L. Milton, Jr., '40

to capture the Republican nomination for governor in 1970. . . . My own news is that I have left Bethlehem Steel Corporation to become Sales Manager of a firm in Allentown, Fermentation Design, Inc., manufacturers of research laboratory equipment for microbiologists, food processors, and petroleum researchers.—**Oswald Stewart**, Secretary, 3395 Green Meadow Circle, Bethlehem, Pa. 18017

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In a most welcome letter, **Jorge Echarte**, I, writes: "I would like my fellow members of the Class of 1940 to know my present whereabouts. After graduation I returned to my native Cuba where I organized a very successful business in the construction industry. When Castro came to power I left the country with my wife and seven children and settled in the United States. Since then there has been one new addition to our family and one more coming up next July. The past four years in this country have been most rewarding and successful. I have again established a flourishing business, Caldos Properties, Inc., a real estate development and construction firm located in Lauderdale-by-the Sea, Fla. In the past four years we have built and sold five condominium apartment buildings containing more than 650 units. A sixth is under construction and a 16-story luxury condominium apartment building with 120 units will start soon on the beachfront. Our largest and most interesting project is a housing development, 'Leisureville' in Pompano Beach. Here we are building 1000 homes (and provide a maintenance program for home buyers) as well as apartment units which will sell for as little as \$7990. There are also two \$250,000 recreation centers and a nine-hole executive golf course. Houses are selling at a rate of 150 month. A somewhat similar project of about 45,000 condominium apartments around a par 72 golf course and a 40-acre lake will get under way near Miami this year. This concise explanation will, I think, give you a general picture of my work. I am very interested in letting my classmates know about me and will be very pleased to hear from them. My regards to all."

Bob Hall, XIII, furnished the information that he has moved from St. Petersburg, Fla., to accept a position with Bethlehem's Sparrow's Point Shipyard in Baltimore, Md., in their Central Technical Division. . . . **Samuel Silver**, VIII, (Ph.D.) gave a talk this spring before the Los Angeles Branch of the Institute of Electrical and Electronics Engineers on "Millimeter Wave and Infrared Studies on Planetary Atmospheres." In laymen's language, the talk pointed out that the properties of the surface layer of a planet and of its atmosphere at present are being investigated by studying the radiation from the planet over as wide a spectral range as possible. . . . **Norman Klivans**, X, has

been elevated from General Manager of the Brush Instruments Division to Vice President of the Clevite Corporation. . . . **Albert Schlechten**, III, Sc.D., has been advanced from Head of the Department of Metallurgical Engineering to Vice President for Academic Affairs at the Colorado School of Mines. Albert and his wife, Eleanor, live at 1904 Pinal Road in Golden, Colo. The Albert W. Schlechten Fellowship at the Colorado School of Mines was donated in his honor by the AMAX Foundation of the American Metals Climax Corporation.

Jim Baird, X-A, is now Director of Sales of the DuPont Pigments Department. He has been in the Pigments Department at DuPont since 1946, his last position being that of Director of Pigments Production. Jim lives at 705 Sycamore Lane, Centerville, Wilmington, Del. . . . **Clare Milton, Jr.**, X-A, who was Director of Development of the Eastern Products Corporation, has been elected Treasurer of the Society of Plastics Engineers. Clare and his wife, Chloe, live in Akron, Ohio. . . . **Clark Godman**, VIII, Ph.D., is now a member of the Atomic Energy Commission. He was recently in the news when the Board held hearings to consider the application of the Omaha Public Power District for a permit to build a nuclear power plant about 19 miles northwest of Omaha. . . . With the following changes of address, this concludes the news for this season: **Donald G. Bay**, Apt. 12-17, 98-05 67th Avenue, Forest Hills, N.Y. 11374; **Runyon Colie, Jr.**, 532 East Mermaid Lane, Philadelphia, Pa. 19118; **Donald R. Erb**, Hillview Road, Malvern, Pa. 19355; **Robert G. Hall**, 3124 B. Walford Drive, Baltimore, Md. 21222; **Harry E. Martin**, 711 9th Street, Apt. 1, Santa Monica, Calif. 90402; **Joseph F. Owens, Jr.**, P. O. Box 1144, Syracuse, N. Y. 13201; and **R. Dixon Speas**, 82 Elderfields Road, Manhasset, N.Y. 11030. . . . Please write to AI during the summer so that we can have a column of full news to begin in the fall.—**Alvin Gutttag**, Secretary, Cushman, Darby and Cushman, American Security Building, Washington, D.C. 20005

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George O. Lloyd has joined as a partner the architectural firm of Crowell, Lancaster, Higgins and Webster located in Bangor, Maine. With George's residency, the firm will henceforth be known as Higgins, Webster and Lloyd. George was formerly associated with the Boston architectural firm of Perry, Shaw, Hepburn and Dean, nationally known for their restoration of Williamsburg, Va. While there as a partner, George was in charge of the buildings for Tufts University, the *Reader's Digest* Office Building in New York, the United States Coast Guard Academy gymnasium and field house facilities, the Mount Washington Climatic Laboratory and the Food and Container Laboratory in Natick, Mass. In 1966 he established a private practice in

Boston under the name of George O. Lloyd, Associates. His recent work was the Data Processing Building for the Associated Catholic Hospitals in Boston, and he has continued as the architectural consultant for Tufts University. He served with the American Division in the South Pacific as a member of the armed forces in World War II. He and his wife Edith now live in Bangor, Maine. They have five children, the oldest, George, Jr., is a graduate student at Yale University, another son, David, is serving with the armed services in Viet Nam, and three daughters, Patty Anne, Nancy and Mary Anne will attend local schools in the fall.

James W. Mar was Wilford W. Clyde visiting Professor of Engineering at the University of Utah during the Spring Quarter under an appointment effective March 25 by the Board of Regents of that institution. He assumed the Wilford W. Clyde Chair of Engineering which was endowed by Mr. Clyde, a U. of U. regent. James is a Professor of Aeronautical and Astronautical Engineering at M.I.T. At the University of Utah he presented series of lectures on subjects of his choice and participated in organization of the mechanics and materials curriculum. His special research interest is fibrous composites and he is an expert in shell theories. Besides his B.S. degree in 1941, he received his M.S. degree in 1947 and his Sc.D. degrees in civil engineering in 1949 from M.I.T. and studied at the University of California at Berkeley during 1958-59 on a National Science Foundation post-doctoral fellowship. He is a member of the American Institute of Aeronautics and Astronautics. . . . **George H. Vineyard, Jr.**, has recently been appointed to the National Science Foundation Advisory Committee for Mathematical and Physical Sciences. George is Chairman of the Department of Physics at Brookhaven National Laboratory, Upton, Long Island, N. Y. . . . **Lyle M. Richardson, Jr.**, has recently been appointed Senior Vice President of Horton, Chirch and Goff, Inc., one of the major New England advertising agencies. . . . **Albert W. Kusch** has been appointed Vice President in charge of employee relations of Atlantic Richfield Company. He has been Vice President, manufacturing, Atlantic Division, since January 3, 1966. His headquarters will be in New York City when executive offices of the company are relocated there later this year. He is presently located at 142 Lakeview Drive, Media, Pa. Albert joined Atlantic Richfield in 1941 as a junior engineer. After a series of promotions, he transferred in 1948 to the Manufacturing Department as Divisional Director of Technical Service. He was named Manager of the Atreco refinery at Port Arthur, Texas in 1961, and became Manager of the Philadelphia refinery in 1965.

Davis R. Dewey has been elected to the Board of Directors of Abcor, Inc., of Cambridge, Mass., which is engaged in bio-engineering, applying the chemical engineering approach to problems of biomedical analysis and separation and has developed proprietary technology in

plant scale chromatography separations and membrane processes. . . . **Loren E. Brunner**, Associate Professor of Electrical Engineering Technology at Purdue University since 1964, has been selected as Outstanding Undergraduate Teacher at the Purdue University Calumet Campus. The selection was made by the students at the Purdue Campus in Hammond and the Faculty Promotions Committee. He is among 12 persons nominated from all schools and campuses of Purdue for the 1967-68 school year for a series of awards sponsored by a Standard Oil Foundation grant to give recognition to effective teachers of undergraduate students. He joined Purdue after his retirement in 1964 from the U.S. Coast Guard after more than 30 years service. His specialty was in precision electronics navigation systems of the hyperbolic variety. He was awarded the Legion of Merit medal for his work in perfecting electronic aids to navigation. Among his assignments was that of Chief of the Electronics Engineering Division at U. S. Coast Guard headquarters in Washington where he directed four electronic engineering branches. . . . **Edward R. Marden** and his wife Natalie were hosts of local area classmates and their wives in a Spring get-together at their home, 61 Bullard Road, Weston, on May 17.—**Walter J. Kreske**, Secretary, 53 State Street, Boston, Mass.; **Everett R. Ackerson**, Assistant Secretary, 16 Vernon Street, South Braintree, Mass.; **Michael Driscoll**, Assistant Secretary, 63 Center Street, Nantucket, Mass.

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From the *American Ceramic Society Bulletin* for March, we noted a feature article by **Willis G. Lawrence**, Assistant Dean of the College of Ceramics at Alfred University. He earned his B.S. at Alfred and his Sc.D. with our Class. . . . **Robert C. Seamans**, another 1942 Sc.D., has been elected to the National Academy of Engineering. Dr. Seamans is a Consultant to the Administrator of N.A.S.A. and this year has been a Visiting Professor in the Department of Aeronautics and Astronautics and in the Alfred P. Sloan School of Management. . . . Short notes on the Alumni Fund envelope flaps furnished interesting info this month. . . . **Lou Rosenblum** is working on miniature optical sound track recording on color film. On the community front, he is analyzing municipal electric power rates and investigating long term financing costs for public schools. So much for the versatility of our math majors! . . . **Trow Kennedy** reports that he has been with Dawborn Division of W. R. Grace Company for 18 years, and is a Senior Research Engineer there. . . . **Dick Russell** is back stateside at Greentree Road, Paoli, Pa., after two years managing Superior Tube Company's division in England.

Ed Pepper has been elected Vice President of Arthur D. Little, Inc. He has been with the company since 1946, and since 1960 has been responsible

for a major portion of A. D. Little work with its clients in the metals and minerals industries. . . . **Bill McGuigan** has been elected to the Board of Trustees of the Licensing Executives Society. . . . **Paul Holte** is keeping busy as Vice President, Corporate Development, of P. R. Mallory and Company in Indianapolis and as Vice President of P. R. Mallory International, Inc., which directs the foreign and subsidiary companies affiliated with the firm. . . . **Lou Stouse** represented M.I.T. at the inauguration of James Ralph Scales as President of Wake Forest University. Since this information comes from a copy of the order to the Technology Store for Lou's academic regalia, we can report that Lou is 5' 10", weighs 185 pounds and wears a 7½ size hat. Apparently he is still in good shape. . . . **Charlie Ricker** has been elected Vice President of U. S. Economics Corporation and has moved from Detroit to New York. Before joining U. S. Economics, he directed Business and Banking Analysis for the National Bank of Detroit and was founder and first President of the Detroit Association of Business Economists. . . . Here's wishing one and all a fine summer with enough time for sending in a short note or better a long newsy letter for the September issue.—**Ken Rosett**, Secretary, 191 Al-bemarle Road, White Plains, N. Y. 10605

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Our famous 25th Reunion is over but not forgotten. About 200 classmates, who paid their class dues of \$25 have received the *Reunion Book*, a magnificent hard-bound volume of 255 pages containing 270 biographies, and pictures and snapshots of prior reunions. In the event that you overlooked paying your class dues during the last year, you may wish to send in the \$25 to your Class Secretary, and he will then mail you the *Book*. Comparing the 1943 photograph with the 1968 photograph of each classmate is an experience well worth the price. . . . Some news items have come in since the *Book* went to press which show promotions and changes which are reported here. **Warren P. Manger**, formerly Manager of Systems Engineering and Advanced Projects, is the new Manager of Advanced Systems and Technology at R.C.A.'s Astro-Electronics Division. . . . **Irene du Pont, Jr.**, Vice President, Director, and member of the Executive Committee of Du Pont Company, was named a Director of Delmarva Power and Light Company. . . . **Richard S. Fallows** has been named Department Head of the Systems Engineering Department at The MITRE Corporation, Bedford. . . . **Jack McDonough**, former Chief Engineer of the Lumber Handling Division, Moore Dry Kiln Company, Jacksonville, Fla., has been named Director of Engineering, a newly created position. In his new position, he will be responsible for total engineering in the company's Jacksonville and Memphis, Tenn., plants.

American Viscose Division, F.M.C. Corporation has announced the appointment

of **Bedrich Hettich** as a member of the Division Manager's Staff responsible for technical development and other special assignments. He has been Manager of Operations Analysis for Avisco film products since 1966. Since joining American Viscose in 1963, he has also served in engineering and management capacities. Prior to that he was with the Chemical Divisions of F.M.C. for four years where he held similar posts. He was previously associated with Shell Chemical Corporation for 10 years. . . . **Donald M. Powers** has joined N.A.S.A.'s Electronics Research Center, Cambridge, as Chief of the Microwave Systems Branch and Special Assistant to the Assistant Director for Systems. Before joining N.A.S.A. Powers was President of General Electric Laboratories, Inc., Boston. . . . **Ward J. Haas**, University-Wide Director of the University of Missouri's Space Sciences Research Center, has accepted a position as Corporate Vice President of the Warner-Lambert Pharmaceutical Company and Director of the Warner-Lambert Research Institute in Morris Plains, N. J. Dr. Haas, who is also Associate Professor of Management, has resigned from his position with the University, effective June 30. . . . **William R. Thurston**, Vice President for Marketing at General Radio Company, was elected a Director of that company at an annual stockholders' meeting held there on March 12. A native of Stamford, Conn., he received his B.S. and M.S.E.E. degrees from M.I.T. and joined General Radio in

1943 as a development engineer. He transferred into sales engineering in 1948 and in 1950 became Manager of General Radio's New York office. He returned to the company's home office in 1955 to develop a new market-research activity and became Vice President for Planning in 1966 and Vice President for Marketing in 1968. He is a senior member of the Institute of Electrical and Electronics Engineers and has held a number of committee offices in that organization.

Elliott C. Levinthal is a co-author of an article entitled "Contamination of Mars," which appears in the March issue of *Science* magazine. . . . **Arthur E. Vershbow** was appointed a member of the National Harvard University Committee for the addition to the central collection of the Harvard Library. . . . **Norman J. Gordon** wrote that he has spent the last year in Kohe, Japan, after two years in Brussels, Belgium. He has four children who speak good French but only fair Japanese. He has sold his business, the Millard Norman Company, but continues as Chairman of the Board working on development and design. He expects to return this year to Palo Alto, Calif. . . . At this time I should like to again express my sincere appreciation to all the members of the Class for their wonderful response to the demands made on them during the 25th Reunion year. I wish I could share with you the enthusiasm which was generated. Our Class is so well knit, so thoroughly gregarious



The University of Florida, Gainesville, has installed a new 30-inch telescope, one of the largest in the Southeast, in its new optical observatory building. Pictured centered in the instrument is Alex G. Smith, '43, Chairman for

Astronomy at the University. The new observatory, according to Dr. Smith, will scan a greater fraction of the sky than those farther north, and will allow photometry of variable stars in a number of projects being pursued by UF astronomers.

and so genuinely friendly that it could well serve as an example and inspiration to any M.I.T. group. And should it ever be otherwise?—**Richard M. Feingold**, Secretary, Ritter and Berman, 266 Pearl Street, Hartford, Conn. 06103

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John H. Burdakin, General Manager in Pittsburgh, Pa., for the Penn Central Railroad, has been elected Vice President and General Manager for the line in Cleveland, Ohio. That item is from "Who's News" in the *Wall Street Journal* for March 28. Congratulations, John. . . . Still in Pittsburgh is **Kenneth G. Scheid** who has written a very interesting article sent to me by the Alumni Association entitled, "College Printing—With Hard Planning Technology Holds Big Gains" in a publication of the American College Public Relations Association. Did you notice Ken's letter to the editor last January commenting with favor on the new appearance of this magazine? . . . **Arthur K. Hoge** of Hartford, Conn., has been promoted from Field Sales Representative to Account Manager for Goodyear Tire and Rubber Company. Arthur joined Goodyear in 1957 and has been a chemical field sales representative in Hartford for eight years. . . . **Peter L. Quattrochi** was scheduled to represent the Institute at the inauguration of a new President for Dean Junior College on May 11. Pete lives in Warwick, R.I., and he is our Class Representative on the Alumni Council. . . . **Walter W. Turner** wrote a note to accompany his Alumni Fund contribution. He has moved to a larger house in Orono, Maine, to accommodate four growing children. Walter is on the faculty of the University of Maine. He reports that last year he was acting Head of the Department of Electrical Engineering but this year he is back to teaching and research and happy to be there.

All the way from Madrid, Spain, comes word from a classmate who hopes to make the 25th Reunion. It is **William T. vanRavenswaay**. William reports that he and his family have been in Madrid since November, 1966. "I am still with Coltex Oil Corporation but have been loaned to our Spanish Associate, REPESA, as Project Manager for design and construction of their new 800 ton per day ammonia plant. It will be near Cartagena and is based on steam reforming of naphtha. Carmen, the boys (ages 5 and 8), and I enjoy living and working in Spain." Do we have a sizeable number of classmates concerned with ammonia plants? That's two months running with items about ammonia plants. Interesting. . . . Because my oldest son, Mark, was a first prize winner in Engineering in the Junior Division of the Science Fair for our local intermediate school, I was present for the area Science Fair some weeks later. (Mark's project is a model of his own design for an underwater habitat called "Aquahab.") At the area Science Fair I became interested in the project of a high school senior, a homemade computer that plays



William R. Thurston, '43



Arthur K. Hoge, '44

tic-tac-toe. Its creator was Robert Mavor. I was not too surprised to learn that he had applied for admission to M.I.T. I found that **Ed Sanders** was his Educational Councilor. I stayed in touch with Bob. A few weeks later he was offered admission to M.I.T. and he accepted. I then called Ed. As a result of that call Ed has read a good amount of the source material on the Giles-Johnson case. I have arranged to get two copies of the report in the hands of classmates. A few days later, Ed wrote to me: "The Giles-Johnson Case excerpts make exciting reading. I know of no other document which has made me think more about crime and punishment. I think there will be more to this story." As a matter of fact there already was. The May issue of *Esquire* (on page 130) has an article entitled, "Rashomon in Maryland." "Rashomon" is a Japanese play involving conflicting stories about an alleged rape incident. The *Esquire* article epitomizes the Maryland case very nicely. It was: (a) Three Negroes raping one white girl, (b) Two Negroes raping one white girl, or (3) One white girl seducing three Negroes. In case you have forgotten, our classmate **Harold Knapp** is the hero in this case. That's page 130 in the May *Esquire*. As for the report of the Committee, drop me a line and I'll get you a copy at least on a loan basis. As Ed says, "It is an incredible story." . . . That's it for this year. When we start again in the fall, those months before the 25th Reunion are going to pass swiftly. There will be time for you to respond to these notes with a postcard and have that postcard reach me before I must prepare notes for the next issue. Do it when you receive the magazine in late July or early August. Have a good summer.—**Paul M. Robinson, Jr.**, Secretary, 7710 Jansen Drive, Springfield, Va. 22150

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Since writing last month our little family has been expanded by the addition of nine collie pups. Their cavorting at age four weeks is most humorous, to put it mildly, and as a spectator sport most time consuming. Enough of this palaver. To get to the business at hand, did you note in *Sports Illustrated* that **Jim Prigoff** won his seventh National Squash Tennis Championship? Earlier in the year Jim won the U. S. Open Squash Tennis Tournament to establish himself as the greatest player of modern times and it is written that in the opinion of many,

Prigoff is the strongest player in the 57 year history of the sport. Great work, Jim. When at Reunion, you told us that you might try an allied sport in the Olympics so we will have to watch the papers. . . . Some notes from you troops advise that **Hal Juckett** is now Sales Manager of the Wood Shovel Division of the Union Fork and Hoe Company, manufacturers of lawn and garden equipment. Hal resides in Worthington, Ohio. . . . **Walt Weeks** advises that he is still Manager of Market Research for Remington Arms and is President of the Southern Connecticut American Marketing Association.

Max Weiss advises that last summer he left Aerospace Corporation to become Manager of Microelectronics Center at T.R.W. Systems in Redondo Beach, Calif. . . . From the clipping services we hear that **Robert Savage** has been named Assistant Market Research Manager of International Nickel. Bob received his master's with our Class and I crossed paths with him in the mid '50s in New York. It is interesting to note that his recent years have been in Paris and London. . . . **Bob Anderson** is most active in politics here in Ohio and had just been re-elected as President of the Ohio Municipal League which is the spokesman for Ohio's almost 1000 cities and villages. . . . **Vince Goddard** has co-authored a paper entitled "A Wind Tunnel Free Flight Technique to Determine Lift and Drag of a Wing Configuration," primarily dealing with their delta wings. . . . Among the movers I note that **Fred Brodersen** is now in Chicago and **Armando Medina** has gone from Caracas, Venezuela, to Rio de Janeiro, Brazil. . . . Will sign off now to reconstruct the puppy pen. They break it as fast as I fix it, or maybe Gina is right and I am a lousy carpenter. In any event, drop us a line.—**Dick O'Donnell**, Secretary, 28516 Lincoln Road, Bay Village, Ohio 44140; **Arnold Varner**, Harvey Hubbell Company, Newtown, Conn.

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Theodore J. E. Glasson has been named Manager, Auxiliary Operations, at the Knolls Atomic Power Laboratory of G. E. He lives at 4 Compton Place, Glenville, N. Y., with his wife Mary and four children. . . . **John G. Farrow** has been appointed Automotive Technical Manager in Detroit by Celanese Plastics Company, and will act as direct technical liaison between the auto industry and the Celanese Research and Development Laboratories in New Jersey to provide on-the-spot plastics technical know-how for the automotive industry. . . . **Elias J. Corey**, Chairman of the Harvard Chemistry Department, recently received the 1968 Fritzsche Award of The American Chemical Society. Dr. Corey, one of the world's foremost organic chemists, has done outstanding work in the chemistry of terpenes, plant compounds related to turpentine, camphor, the plant pigment carotene and vitamin A. The medalist has synthesized and determined the structures of many terpenes, which are

essential to the cosmetics, paint, lacquer, and varnish industries.

Paul V. Grambsch, Dean of the University of Minnesota's School of Business Administration, is co-author of a study of the problems which presently beset the university. In view of the recent headlines involving student insurrections, the study appears timely. The final report is entitled, "Academic Administrators and University Goals: A Study in Conflict and Co-operation," and is to be published in book form later this year. It is presently available in report form from ERIC Document Reproduction Center, Bell and Howell Company, 1700 Shaw Avenue, Cleveland, Ohio. . . .

Norbert E. Andres, Jr., has been appointed Vice President, Marketing, and is a member of the Board of Directors of Astro Space Laboratories, Inc., at Huntsville, Ala. Astro specializes in north seeking gyrocompass systems. . . . **George W. Swenson, Jr.**, is Professor of Astronomy and Electrical Engineering, and Director of the Vermilion River Observatory at the University of Illinois. He is presently on leave at the National Radio Observatory at Charlottesville, Va. . . . We have received a note from Harold C. Pearson, '23, of the M.I.T. Club of Mexico City stating that **Edward Hanley** and Mary, and **Jack Page** and Imogene attended the 1968 Fiesta in March. We hope they enjoyed it as much as Jack and Imogene did last year.—

Richard V. Baum, Assistant Secretary, 6711 North 22d Street, Phoenix, Ariz. 85016; **John T. Reid**, Assistant Secretary, 22 West Bryant Avenue, Springfield, N. J. 07081; **Robert R. Mott**, Secretary, Kent School, Kent, Conn. 06757

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Over 900 envelopes with your names on them have already gone out with a questionnaire about our 20th Reunion. Please send the card back *now* if you haven't done so already. The information you send will help us greatly. With your help, we will have a memorable time.

. . . **Luke Mayer** writes that he was relieved of his duties as Commanding Officer of the U. S. Navy Repair Facility on Guam (the navy's smallest) only to become Deputy Commander of the San Francisco Bay Naval Shipyard which is the largest shipyard in the world.

. . . **Philip Lynn** tells me that he was transferred from the Boston Office of the Public Buildings Service of the General Services Administration and has wound up in New York City where he is Chief of the Design and Construction Division. Phil directs design and construction activities in New York, New Jersey, Pennsylvania, Delaware, Puerto Rico, and the Virgin Islands while spending \$300,000,000 a year in the process. . . .

Charles Barr writes that he is Associate Director of Urban Planning in the School of Urban Planning and Landscape Architecture at Michigan State University.

. . . **Frederick J. Beutler** is Professor of Information and Control Engineering at the University of Michigan but has



John G. Farrow, '48



Robert E. Burrell, '51

recently been a Visiting Professor in the Department of Electrical Engineering at California Institute of Technology. Dr. Beutler received his bachelor's and master's degrees in economics and engineering from Tech and his Ph.D. in engineering science and mathematics from Cal Tech. He has recently been working on applications of functional analysis to systems theory, and also on the theory and application of random point processes. . . . **Dick Baxter** writes that he is presently Instrumentation Specialist for Philco-Ford in Newport Beach, Calif. His children, Ira, 16, and Valerie, 15, are honor students at Estancia High School. Dick's principal hobby is flying a Cessna 182 around the country, including trips to Massachusetts in '63, '65, and '67. His wife, Shirley, is also a pilot and a registered nurse.

David A. Eberly has been elected a Vice President of Warwick Electronics, Inc., in Chicago. In this capacity he will be concerned with Personnel and Planning. Prior to joining Warwick, Dave was a Senior Vice President and General Manager of the Telemetry Division of Electro-Mechanical Research, Inc., in Sarasota, Fla. . . . **David R. Israel**, on leave from the MITRE Corporation to be Deputy Director for Engineering of the Defense Communications Planning Group, has received the highest praise from former Defense Secretary Robert S. McNamara for his outstanding contribution to an endeavor of great national defense importance. Although phrased in the most non-specific terms, one gets some inkling of Dave's responsibilities by these words from Secretary McNamara's commendation: "The task was one involving major research, engineering, development and training. It was to be very large in scale and was to involve the resources of *all military services and civilian science and industry.*"

John P. Horton wrote a fine letter having to do partly with the 20th Reunion and also bringing us up to date on his present activities. John sells brushes to put it simply. He is Chairman of the Board of the Newark Brush Company, is a Director in a brush company in Denmark, and another in North Wales. He is presently trying to set up a joint venture in Japan for a brush company there. On the side, and just for kicks, John started a plastics business in January of this year. John infers that idleness is not one of his problems.—**Fletcher Eaton**, Secretary, 42 Perry Drive, Needham, Mass. 02192

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Nicely noted from New York: the firm of Bentel and Bentel, architects, received honorable mention in a competition for the first housing architectural competition held by New York City. The judges had not originally intended to offer awards beyond the standard prizes but noted that, of the 87 entries, the Bentels' entry was of sufficient interest to warrant a special prize. Mrs. Bentel is **Maria Azzarone**; Mr. Bentel, Frederick, received his master of architecture degree from M.I.T. in 1950. Sandwiched in between their busy architectural practice, Maria runs a household with Paul, 10½, Peter, 7, and Elisabeth, 2½. . . . Another accomplished architect, **Henrick Bull**, has been elected President of the Northern California Chapter, American Institute of Architects. Henrik is a member of the M.I.T. Educational Council, has been a visiting critic in architecture at Syracuse University, and is currently practicing in San Francisco. . . . **Dean Boorman** has a growing city planning practice (Boorman and Dorran, Inc.) and a growing family—two boys and a girl. . . . **Robert Burrell** is Manager, Water Quality Control Systems, Robertshaw Controls Company in Anaheim, Calif. . . . **William J. Callahan** is Vice President of Philbrick-Booth and Spencer in Hartford, Conn. He and Millicent have two children, William, Jr., is 14 and Lauri is 9. . . . **Albert Cohen**, President of Electronic Space Structures Corporation (E.S.S.C.O.) in West Concord, Mass., has put together a group of companies to produce totally integrated radome/antenna/pedestal systems to provide superior performance at reduced cost. . . . **Louis Dion** is System Director, Quality Control, for Eastern Airlines. Prior to joining Eastern he had been with General Electric. Lou will be based in Miami.

Ranger Farrell authored a critique on coordination of air, light, and sound. Ranger was formerly with Bolt, Beranek and Newman but more recently formed his own firm: Ranger Farrell Associates. He also teaches at the Parsons School of Design and is a Visiting Lecturer at Princeton. . . . **John D. Fox** was selected as a senior Postdoctoral Fellow by the National Science Foundation. Under this fellowship, he will spend a year in Germany at the Max Planck Institute for Nuclear Physics. John is a Professor of Physics at Florida State University. . . . **Carl N. Graf** is Vice President of the Industrial Chemicals Group, W. R. Grace and Company. . . . **Henry Jex** is still a prolific publisher of technical articles in the field of automatic controls. Henry is with Systems Technology, Inc., Hawthorne, Calif. . . . **John Kalvinskis** is Manager, Environmental Management Systems, at Autonetics Division of North American Aviation. He was recently a candidate for Chairman of the Southern California Section of A.C.S. After M.I.T., John received a Ph.D. from Cal Tech and joined North American in 1960. . . . **Gerry Lyons** and Charles de Veguar are

partners in the Cheviot Corporation, a construction company in the Boston area. Gerry and Ginny have two boys and a girl and live in Norwood, Mass., and Charles and Stephanie have the complementary trio: two girls and a boy. . . . **James McKenna** published an article in the *Bell System Technical Journal* rather recently in the field of quantum mechanics and optical waveguides. Jim received a Ph.D. in math from Princeton in 1961 and has been with Bell Labs since. . . . **William F. O'Connell, Jr.**, is Manager of I.B.M.'s Large Systems Requirements. Bill has been with I.B.M. since 1954. He and Maureen have three children and live in Poughkeepsie, N. Y. . . . **Rai Okamoto, M.A.**, IV-A, is a Principal in the San Francisco firm of Okamoto/Liskamm, urban designers and planners. The firm recently won an award to study the location of the new subway station at Harvard Square in Cambridge, Mass. This study will consider the impact of the proposed John F. Kennedy School of Government and plan the future physical form of Harvard Square with projections for its traffic patterns. . . . **David Sadick** spoke at a recent meeting of the Insurance Society in Worcester, Mass. David has been a Public Insurance Adjuster for the past 13 years. . . . Among the contributors to a new book *Modern Composite Materials* I found that **Peter T. Shaffer**, Carborundum Company, Niagara Falls, N. Y., had written a chapter. . . . **Howard Simmons** was a speaker at the Philadelphia Organic Chemists' Club. Howard is with the Central Research Department, Du Pont, where his primary interests are in the application of quantum mechanical techniques to chemical problems. He has served on the A.C.S. Subcommittee on Education, on the Editorial Board of the *Accounts of Chemical Research*, and during 1968 he has been the Arthur and Ruth Sloan Visiting Lecturer at Harvard. . . . **Tom Stansfield** was promoted to Manager of Marketing and Licensing for the Capsular Products Division of National Cash Register Company, Dayton, Ohio. It seems strange for N.C.R., but some of the products under Tom's jurisdiction which utilize N.C.R.'s microencapsulation technique are Measurin (a time released aspirin), Muriel Mint and Menthol Cigars and Northern Brand Menthol Facial Tissues. Tom is serving as the President of the Miami Valley (Ohio) Chapter of the Arthritis Foundation this year. He and Edyth live in a large old English house in Dayton which they have refurbished and to which they recently added an organ. The Stansfields have four children: twins—Scott and Susan (13), Craig (12) and Sarah (6). Tom would be happy to hear from other classmates living in or around Dayton, or even passing through. I feel particularly remiss at not having given him a call considering the number of times that I have been either to Dayton or have passed N.C.R. on the way to meetings at the University of Dayton.

Alan Stenning, S.M., II, has been appointed Acting Chairman of the Mechan-

ical Engineering Department at Lehigh. . . . **Bernard Widrow** is an Associate Professor of Electrical Engineering at Stanford. We got this information from the biography accompanying a paper that he co-authored in the proceedings of the I.E.E.E. on "Adaptive Antenna Systems." Bernard has been at Stanford since 1959; before that he was on the faculty at M.I.T. and had been at M.I.T. Lincoln Lab. . . . **Robert Woolworth** has been named Associate and Project Manager of Joseph S. Ward, Inc., consulting engineers, Caldwell, N. J. Bob has been associated with projects throughout the world dealing with flood control, airports, highways, utilities, etc. His broad experience as a soils engineer began with Skidmore, Owings, and Merrill; he then joined Tippetts-Abbett-McCarthy-Stratton. He and Sylvia live in Bloomfield, N. J., and have five children, that is an increase (by 2) over that reported when he last appeared in these notes. . . . Our season ends with this issue and all of us wish you a very pleasant summer. For those of you who wrote to us, we thank you and hope that you will continue to send us news; to those of you who didn't write we hope that you will change your ways in 1968-69. I want to say that I look forward to "seeing" you again in these columns in the fall, but at this writing, I am not sure that I will. I spent March in France and England with an organization which has invited Ellie, myself and the children to spend next year in Paris. The idea is exciting, certainly, but it does present a few problems. I'd love to hear from those of you who have packed up with your families and gone to Europe for a year or so. I will make the decision about the time that this issue comes out.—**Howard L. Livingston**, Secretary, 358 Emerson Road, Lexington, Mass. 02173; Assistant Secretaries: **Marshall Alper**, 1130 Coronet Avenue, Pasadena, Calif. 91107; **Walter O. Davis**, 346 Forest Avenue, Brockton, Mass. 02401; **Paul G. Smith**, 11 Old Farm Road, North Caldwell, N.J. 07006

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Albert J. Nash is President of Educational Technology, Inc., which manufactures and distributes school equipment including language laboratories, electronic classrooms, teaching machines and closed circuit T.V. . . . **William C. L. Wu** has been named Section Manager of



Louis G. Dion, '51



Robert S. Woolworth, '51

Polymex Development at Chemplex Company, Rolling Meadows, Ill. . . . **Husevin Yilmaz's** work at A.D. Little Company on methods of using the human voice to command computers has led to improved methods of teaching deaf children how to speak. . . . **George A. Filak** is Vice President of the Dallas Alumni Club for '68 and Chairman of M.I.T.'s Southwest Regional Conferences Finance Committee. . . . **Jerome B. Cohen** is Professor of Materials Science at Northwestern University. In addition to his research papers, a text written by him is in its second printing and he has co-edited another volume. . . . **Kenneth B. Larson** is doing research in novel semiconductor materials and devices at Monsanto's New Enterprises Division. He and wife Katie "find St. Louis an exciting place musically and artistically," and their "four children are all in school now and thriving." . . . General Manager of the recently formed New Enterprise Division is **Richard S. Gordon** who had been Director of the Central Research Department since 1963.

William McCollam, Jr., Arkansas Power and Light Company's Senior Vice President, has been selected to become Managing Director of the electric industry's trade association, Edison Electric Institute. He is a former Lt. Col. in the U.S. Army Corps of Engineers and was Associate Professor at the U.S. Military Academy prior to joining A. P. and L. . . . **Sanford I. Rock** has recently been appointed Manager of Sales, Nuclear Fuels, for Allied Chemical Corporation's Industrial Chemicals Division. He is responsible for worldwide sales of nuclear products for the commercial electric power field. . . . **Coley Bressee** is Deputy District Attorney for San Mateo County. . . . **R. J. Charles** co-authored a report in the American Ceramic Society's bulletin on "Metastable Immiscibility in the $B_2O_3-SO_2$ System." Dr. Charles is Senior Scientist at G.E.'s Metallurgy and Ceramics Research Department. . . . **David B. Whelpley** reports that he is with Roadway Express, Inc., Trucking in Akron, Ohio, where he is Director of Income and Expense Analysis. He is married and has five children. . . . **William D. Toole** is Hartford's City Planning Director and, according to my clipping data, embroiled in a hot political controversy over his appointment to head up Hartford's model city project. . . . **Eugene A. Graham** has published a paper on "Passive Compensation Theory for Advanced Systems Circuits" in the *I.E.E.E. Transactions*. Dr. Graham is currently Professor-Researcher at the Université de Paris, Ecole Normale Supérieure, Laboratoire de Physique. Prior to 1966 he held a succession of senior engineering positions at Microwave, Raytheon and Space General Corporation. . . . U.S. Air Force Major **Arthur Sargent, Jr.**, has received the Air Medal for air action in Southeast Asia. Major Sargent was cited for his outstanding airmanship and courage as a troop carrier pilot. . . . Col. **Samuel Yanay** discussed the current situation in Israel at the Hartford

Community Center and outlined youth opportunities in Israel during a speaking engagement in Baltimore. Col. Yanay was Commander of Civil Defense for Tel Aviv during the war there last year and is currently an Official Representative of Israel. He was instrumental in establishing the Israel Navy Operations from 1958 to 1961. . . . **Anthony Romano** spoke on "What Effect Baystate West will have on the Economy of the Community" at a Springfield Retail Credit Association meeting. . . . **Charles Smith** was married last fall but I do not have any details. Charlie is still with New York Central. . . . **Robert E. Anslow** has been promoted to Comptroller of Roanwell Corporation from his position as Assistant to the President. He will handle all matters pertaining to corporate financial control. . . . Caloric Corporation has appointed **George Bartolomei** to the new position of Manager of Value Engineering. . . . **Z. J. J. Stekly** co-authored a paper entitled "Use of Superconducting Coils as Energy Storage Elements in Pulsed System Operation." Dr. Stekly is Director of the Superconductivity and Cryogenics Operation at the Avco Everett Research Laboratory. . . . **Jerome Catz** is Associate Professor of Mechanical Engineering at the University of Miami, Coral Gables, Fla.

Plans are firming up for our 15th Reunion next June. Why not reserve the weekend of June 13, 14, and 15 now, by marking your calendar? The place—Jug End, South Egremont, Mass., a resort hotel in the Berkshires with all sorts of facilities. Suggestions regarding activities or volunteers for participation on one of several committees will be appreciated. Committee work will start gaining momentum in the fall. Just contact: **Bob Warshawer**, 11 Tower Road, Lexington, Mass. or myself—**E. David Howes, Jr.**, Secretary, Box 66, Carlisle Mass. 01741.

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Kindly disregard our recent out-of-date report on **Roy Salzman**! He has joined Arthur D. Little as a Consultant in Management Sciences, and the Salzman family's "dream house" in Carlisle is by now probably well underway. . . . June a year ago **Marsbed Hablanian** became Manager of Engineering and Development of National Research Corporation in Newton. . . . **Ed Ehrlich** became Production Manager of the

Poughkeepsie plant of Western Publishing Company in 1967—and a father for the sixth time. . . . **Russell Collins** wrote from St. Paul that he was preparing to present a paper in June at the 18th International Congress of Actuaries in Munich. . . . After five months in Washington, D.C., **Dave Prongay** moved his family, including a new daughter born in January (three children in all), to Houston where he is a Line Manager for Guidance and Control on Spacecraft Technology. . . . His fourth child arrived in 1967 reports **William Jewell**, Professor and Chairman of the Department of Industrial Engineering and Operations Research at Berkeley. . . . **Donald Burress** at the University of Oregon Medical School was in the process of completing his residence in ophthalmology this spring. . . . About this time last year **Charlie Prewitt** supplied us with an article from the sports pages of the Philadelphia *Bulletin* about **Jim Bartsch**, who lives in Stanton, N.J., "the father of the modern one-piece (golf) ball." In 1959 Jim, a non-golfer, bought an interest in a firm that put new covers on balls. The firm switched to manufacturing balls while Jim began to look for ways to improve ball centers, then finally to develop a completely new one-piece ball from a synthetic elastomer. He has received patents in Britain, Canada, and the U.S. and sold 80 per cent of his interest to Princeton Chemical Research, Inc., which has established the Princeton Chemical Patent Development Corporation to grant licenses to make the Bartsch ball. Though representatives of firms selling golf balls find the relatively indestructible solid ball a source of declining repeat business, they admit that it is "the ball of the future" and will probably replace the conventional wound ball within 10 years.

On May 31, 1967, **Frank Bonner** received the Philosophie Doktor from the University of Uppsala, Sweden. Let me quote you some of his delightful reply to our pleas for news. "There is no ceremony connected with the award of the two lesser Swedish university degrees, but the Swedes more than make up for it when it comes time to award the doctorate. Several weeks before the public defense of the doctoral thesis the university appoints a First Opponent, the doctoral candidate chooses the Second Opponent and also nails his thesis to a special bulletin board in the main university building. On the appointed day (which is given a 'big play' in the local newspaper) the candidate and his opponents—all in 'coat and tails'—march into an auditorium before a panel of professors and any interested public. (I was particularly honoured with the presence of the American Science Attache, Dr. Clyde McClelland, '52. Dr. McClelland was acquiring his doctorate at Tech about the time we were getting our bachelor degrees.) The First Opponent criticizes the technical content; the Second Opponent, all other aspects of the publications, and the public is free to question and to criticize as they wish. That evening the

candidate usually gives a dinner and a reception (as I did). On the morning of May 31 cannons on the hill by the castle boom forth—once for each doctorate to be awarded later in the day in the main university hall. Cannons are also placed just outside this hall and are fired at the instant the laurel wreath is placed on the candidate's head—thus making him a doctor. (The new doctor can have *his* shell as a souvenir. I can testify that it is very large and very heavy.) In rapid succession the Promoter also presents a doctoral ring and a very large diploma, saying very much in Latin, and music is being played in the background. What a ceremony! In the evening there is a formal banquet and ball in the castle."

Let us attempt to give you an accumulation of items about those who received graduate degrees in 1955. Watch the dates; some of these are pretty old. In May, 1967, **William Prindle, Sc.D.**, Corporate Director of Research for Ferro Corporation, Cleveland, was made a Fellow of the American Ceramic Society. . . . In August, **David Rossin, S.M.**, was appointed a Fellow of the Adlai Stevenson Institute of International Affairs in Chicago. Having received a master's degree from Northwestern in business administration in 1963 and a doctorate in metallurgy from Case in 1966 in addition to working 12 years at the Argonne National Laboratory, he expected to devote his time this past year to a study of migration of scientists, engineers, and physicians, "the brain drain." . . . In July, the Museum of Science of Boston named **George Edmonds, Jr.**, a staff member of the M.I.T. Instrumentation Lab, a new member of the Museum Corporation. . . . In December, Colonel **Ray Hansen, S.M.**, received his second Legion of Merit award, this one for his work in Vietnam in construction and rebuilding projects for roads and bridges and his civic action program including the rebuilding of wells, schools, etc., and the acquisition of food and clothing for refugees in the area. Now back in Washington, D.C., he is an Operations Research Analyst in the Office of the Chief of Staff, Army, and Office of the Director of Weapons Systems Analysis. . . . Last July **Warren Bennis, Ph.D.**, left M.I.T. to become Provost of the Faculty of Social Sciences and Administration at the State University of New York at Buffalo.

Bayard Storey, S.M., was appointed an Assistant Professor of Physical Biochemistry at the Johnson Research Foundation of the School of Medicine, University of Pennsylvania, in July, 1967. . . . **Kenneth Watson** wrote in November from Gainesville, Fla., that he has been on the faculty of the University of Florida for over a year, having come from Rice, where he acquired a Ph.D. in 1966. Ken and Betty have two boys and a girl. . . . **Paul Julien, Ph.D.**, reported last December his new position as Manager of Advanced Technology and Testing at the Jim Walter Research Corporation in St. Petersburg, Fla.



William McCollam, '54



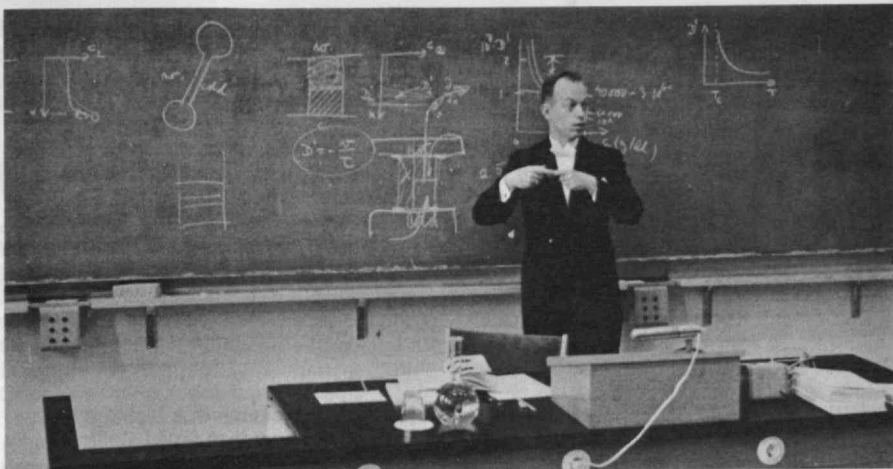
James Goldey, '55

... In May, 1967, **Andre Deprez**, S.M., was elected Vice President, Marketing Services, of Scientific Design Company of New York. The Deprez family lives in New Canaan, Conn. ... **James Goldey**, Ph.D., of Allentown, Pa., has been promoted to Director of the Materials and Process Technology Laboratory at Bell Telephone. ... **Astra Zarina-Haner**, M.A., writes that her own small architectural office in Rome, Italy, has "much to do, but very little success." We assume this is modesty from one who had the Rome Prize Fellowship and a Fulbright Grant in 1960-1962 and who was invited to teach at the University of Washington in the winter of 1965. ... In June, 1967, **Philip Baltzer**, S.M., was named Head of the new Laboratories R.C.A., Inc., facilities which had just opened near Toyko. ... This leaves us an empty file; your turn to write now! Have a good summer.—Secretaries: **Dell Lanier Venarde** (Mrs. J. H.), 16 South Trail, Wilmington, Del. 19803; **L. Dennis Shapiro**, Aerospace Research, Inc., 130 Lincoln Street, Boston, Mass. 02135

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On May 7, Bob Malster, Bill Grinker, Guy Spencer, Dave Goldman and yours truly spent the evening telephoning a hundred classmates around the country in a last minute reminder for the Alumni Fund. This was during the phone strike which complicated the problem. Some of the following is fallout from that evening: **Matt Barrett** is working for Exotech in Washington as Program Manager on a N.A.S.A. contract dealing with solar cells. ... **Bob Biehl** is Chief of Pediatrics at St. Albans Naval Hospital in Long Island and is still in the Navy. ... **Lee Dean** recently moved to Connecticut to work for Pratt and Whitney on engineering in acoustics. ... **Dave Goldman** has been working for Di-An Controls in Boston since 1957. The company now employs 200, and a major new product is remote ticket printers tied into central reservation computers. ... **Stu Harvey** is Sales Manager of the Memphis office of I.B.M. ... **Ted de Winter** teaches classes for A.V.C.O. Research on Tuesday evenings. ... **Bob Lukacik** and wife were in Europe in the first part of May. ... **Joe Neville** received his master's from Tech in 1965 and is now teaching at Wentworth Institute. ... **Bob Santos**, our man at New England Tel., spent the strike working in New Hampshire.

Eugene Amazon reports he is now at International Scientific Systems in Geneva, Switzerland. ... **Walt Baturka** writes that he is Chief Engineer at Erickson Tool Company in Solon, Ohio—a manufacturer of precision tool and work holding devices. Previously he had worked for Warner and Swasey and T.R.W. Walt is on the Executive Committee of the Cleveland A.S.M.E. Group and completed his M.B.A. at Case-Western Reserve in 1962. With wife Barbara and children—Natalie and Bradley—he lives in Chagrin Falls.



Francis Bonner, '55, recent recipient of the degree of Philosophie Doktor from the University of Uppsala, Sweden, at the public defense of his doctoral thesis.

Phil Bromberg is a Fellow at the Mellon Institute and Assistant Professor of Chemistry at Carnegie-Mellon University. Last year a second child, Mark, was added to the family. ... **Fred Culick** was a principle lecturer at a June seminar on "Combustion of Solid Rocket Propellants" held by the American Institute of Aeronautics and Astronautics in Atlantic City. Fred is now an Associate Professor at Cal Tech and a Consultant to the China Lake Naval Weapons Center. ... **Walt Farrell**, with his wife and four children, has settled in McLean, Va., and he practices diagnostic radiology at Fairfax Hospital in Falls Church. ... On the Philadelphia plane the other night I ran into **Gil Karp** who is a thermal engineer for G.E. Missile and Space Division. He and Linda have a son and daughter and live in Mount Airy. They met while they both were working at the Franklin Institute. ... **Joe Murgio** is Manager of Systems Design and Analysis at I.T.T. Defense Communications—Digital Computers for Communications and Message Switching. Joe and Diane now have three children, Joseph, Thomas and Andrew. ... **Thomas Yonker** is with Industrial Nucleonics Corporation in New York.

The April promotion list at M.I.T. carries news of the elevation of classmate **Jack Saloma** to Associate Professor in the Department of Political Science. ... A correction to our May notes: The Malster's new son is named James Emmet.—Co-Secretaries: **Bruce B. Bredehoft**, 16 Milbrook Road, Westwood, Mass. 02090; **T. Guy Spencer, Jr.**, M.I.T., Room E19-439, Cambridge, Mass. 02139

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I regret very much missing last month's issue; at the last minute I had to go to the Continent for a two-week business trip and left my file behind. I'll try to make up for it this month. As I write this column, I'm sitting in the lounge of a hotel at Burenstock, near Lucerne, Switzerland. If the weather was clear

I would see below me Lake Lucerne; in the distance, the town of Lucerne; and all around, beautiful snow-capped mountains. The weather isn't clear, however. It is raining and we are in the middle of a cloud—good weather for writing class notes! ... Now for the news. A recent letter from **Art Bergles** reads as follows: "In response to your recent plea for newsy help, I can offer some personal items to catch up on the past several years. My teaching, research and consulting activities have been largely in the area of heat transfer, particularly boiling and two-phase flow. I was just promoted to Associate Professor of Mechanical Engineering. In addition, I am Associate Director of the Heat Transfer Laboratory and Chairman of the Engineering Projects Laboratory. I am still Alumnus Advisor of Theta Chi. Penny and I moved to Lincoln two years ago. We have two sons, Eric, 3½, and Dwight, born on March 1 of this year."

Fitz Rawls writes that he is living in a small town outside of Tampa, Fla., and would like to hear from any classmates who pass his way. Fitz is married and has two sons. ... **Dominick Fortunato** is now working as an Associate Metallurgist in the Metals Division of the Illinois Institute of Technology Research Institute. He expected to receive his M.S. in metallurgical engineering from I.I.T. early this year. ... **Bill Walsh** is a Planning Associate in the North American Division of Mobil Oil. He and Helen have a daughter and two boys.

Joe Rosenshein received his Ph.D. in physics from M.I.T. in 1963. After one additional year at M.I.T., he went to the Instituto de Fisica of the University of Rome as a Fulbright Research Scholar. His work there was on ions in liquid hydrogen. He returned to the U.S. in September, 1966, to work at the University of Florida as an Assistant Professor in the Department of Physics and Astronautics. Joe married Ingrid Hellurg (a Fulbright soprano from the Eastman School of Music, Rochester, N.Y., whom he met going to Italy) in

September of last year at the M.I.T. Chapel. They are now living in Gainesville, Fla.

Richard Knapp is a Supervisor of Nuclear Design and Analysis for Combustion Engineering, Inc., and a Sales Representative for Casavant Frères Limitee a Canadian Pipe Organ builder. In addition, Dick serves as the Director of Music for the First Methodist Church of Hartford. He and his wife, Demaris, reside in Bloomfield, Conn., with their three children. . . . **Tom Roberts** is Program Director of the Bureau of Industrial Relations at Michigan University. He is responsible for various management courses, the Industrial Relations Lecture Series, and the Department of Training Materials. He is also an active author and consultant. . . . **Bill Adam** is now living in Rhode Island. He is managing partner of Peat, Marwick and Mitchell's Providence Office. . . . **Harry Salesky's** wife, Eleanor, dropped me a note to say Harry has become President of Champ Hats, a subsidiary of Hat Corporation of America. They are moving from Lewisburg, Pa., to Harrison, N. Y. Harry's office at 3 East 57th Street was decorated by **Andrew Blackman**. Harry and Eleanor have three sons.

David Lukens is in Liberia teaching math and physics. He says that in his physics courses he is using all of the ideas and tricks he learned under Professor Bitter. In his spare time he is reading medieval history to see if there is any comparison between medieval Europe and developing countries in Africa. . . . **Ron Kintisch** has joined Herman Jacobs, '55, in a management consulting practice dealing with organization, planning, management control systems and data processing. His firm has offices in New York and Philadelphia. . . . **Harry Lee** co-authored the paper judged best in any of the *I.E.E.E. Transactions* and thus won the W. R. G. Baker Price Award. The title of the paper was "Network Synthesis Using Lossy Reactances." Harry is with Lincoln Laboratory. . . . **Ralph Warburton**, about whom we have heard much in recent months, was recently elected a member of the Committees on Urban Design and Housing of the American Institute of Architects, appointed Professional Advisor to the Jury on Urban Transportation Design Awards for the U.S. Department of Housing and Urban Development and served as Visiting Design Juror for "New Towns," a competition sponsored by the M.I.T. Department of Architecture.

Paul Cotter is now Chief Engineer for Truog-Nichols (mechanical contractors and engineers with home offices in Kansas City). He and his wife, the former Karen Maxwell, have four children. . . . **Don Aucamp** is Assistant Professor of Industrial Engineering at St. Louis University. He is teaching operations research courses and attending Washington University part time in a Ph.D. program of applied mathematics. . . . **Bill Fleischer** writes that he was recently promoted at Ingersoll-Rand to General Manager,

Tool and Hoist Sales. He added: "I'm enjoying my spare time with wife Barbie on our small South Jersey ranch ("Locust Ranch") with two ponies, two horses and lots of German shepherd show dogs." . . . **Bob Holton** is presently Plant Manager for the Cowles Chemical Division of Stauffer Chemical Company at its Joliet, Ill., plant. He writes: "Besides keeping busy with a 5 year old son and new daughter, I am Vice President of local manufacturer's association, Vice Chairman of Joliet Junior Achievement District, a member of Rotary and active in church government."

A biographical sketch in a technical journal advises us that **David Colling** is a staff member in the R. and D. Division at Westinghouse where he is responsible for research on expansion alloys and magnetic alloys. . . . **Ken Shroff** has been appointed a Staff Systems Planner for I.B.M. in Yorktown Heights, N.Y. Ken and his wife have one child, a girl about a year old. . . . **Henry Durivage**, a Captain in the Air Force, is now stationed at Offutt A.F.B. in Nebraska, headquarters of S.A.C. Currently he is in the Computer Management Office which is associated with S.A.C.'s intelligence function. This is his tenth year in the Air Force. . . . **Bill Griffin** is working at N.A.S.A.'s Lewis Research Center. Married in July, 1965, he and Loretta Mae have one daughter.

John Varela is still working in Atlantic City with MITRE testing automated air traffic control systems. He and his wife, Carole, have three sons. He sees **Kim Seward** and Ginny. Kim is working for I.B.M. **Paul Bauschatz**, John reports, is still teaching freshman English at Columbia and **David Vaughan** is working for McDonnell-Douglas in California after a year teaching in London.

Edward Friedman is with Avco's Space Systems Division in Lowell, Mass. He and his wife (the former Harriet Carol Gold, Wellesley, '58) live in Marblehead with their two children, a girl age seven, and a boy about four. . . . **Harry Duane**, a Vice President of Norton Company in charge of International Relations, has been appointed a Director of the National Foreign Trade Council. . . . I was saddened to learn of **Ralph Brown's** death in December. The Boston *Globe* reported that Ralph was active in many professional chemical engineering societies and well-known for his work in nuclear fuel cells. He was studying, at the time, for his Ph.D. in chemistry at M.I.T. I'm sure all of you join me in extending condolences to his wife (the former Barbara Forman), his children, his mother and four brothers. . . . Finally, **Bill Salmon** was married in September to Josephine Stone, a graduate of McGill University. Bill and Josephine will make their home in Washington where Bill works as a Science Officer with the Department of State. . . . That's all until the fall. I look forward to seeing any of you who get through London this summer. Please call me at the office (839-1262) or at home

(235-2720).—**Frederick L. Morefield**, 18 Waddon House, William Mews, London SW1, England

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There will be a long pause between this issue of the *Review* and the next one, so I'll have to catch up on all my back mail very quickly. . . . **Farley Fisher** wrote with news of **David Culver**: "After leaving Digital Equipment Corporation, he has set up his own computer software company called Agrippa-Ord, Inc. He runs the business from an office in his home in Carlisle, Mass., where he lives with his wife and daughter." Farley also reports that **Craig Fletcher** and his wife are living in Arlington since returning from an extended European trip. Craig has been transferred from the Los Angeles to the Boston office of Bolt, Beranek and Newman where he is a Programmer. Thanks for the news, Farley. . . . Captain **Bruce Layton** has been recognized for helping his unit earn the U.S. Air Force Outstanding Unit Award; He is a Missile Launch Officer in the 381st Strategic Missile Wing at McConnell A.F.B., Kansas. . . . **Mark Porter** is Group Leader and Senior Scientist in Materials Research at the Lowell Avco plant; he also serves as a Mutual Fund Specialist with the Newton Investment Company. . . . **George Schnabel** has been appointed Process Engineering Supervisor at Rohm and Haas Company in Philadelphia; he will be responsible for the supervision of all process evaluations and developments in the company's Research Division. . . . Captain **Niels Andersen** has been awarded the Air Force Combat Crew Badge at McGuire A.F.B., N.J. Niels is a C-141 pilot and is a member of the 30th Military Airlift Squadron of the Military Airlift Command (M.A.C.). The 30th, a C-141 Starlifter jet transport aircraft unit, flies missions into Southeast Asia, as well as making aeromedical evacuation flights to Europe.

Walter Crewson is presently Department Manager, Electrical Engineering at E.G. and G.; he's in the advanced directorate, high voltage pulsed power and digital systems work. He received an M.S.E.E. at Cornell after M.I.T., and has been at E.G. and G. for the past six years. He married Anita E. Jung (a Deaconess Hospital R.N.) in December, 1963; they now have two children—Laura, 3, and Nancy, 6 months. . . . **John Piper** is now Manager of Technology at Union Carbide's Electronics Division in Greenville, S.C. . . . **Carlo Piazza** writes that he has "been working for A.M.O.C.O. Chemicals in Whiting, Ind., in Process Design and Economics since July, 1967. Love it." . . . From **Bill Larrabee**: "I am now a Consultant for the firm of Theodore Barry and Associates. We do management consulting in many fields, but I have been working particularly in the Aircraft/Air Transportation industries." . . . **Radoslav Zuk** has been promoted to Associate



George A. Schnabel, '60 Richard E. Monahan, '60

Professor of Architecture at McGill University in Montreal (in the fall of 1967). He was a codesigner of "Children's World" at Expo '67, and is gaining recognition in Canada and abroad as a church designer—has built six since leaving M.I.T. . . . **Larry Elman** has three major aviation history articles appearing in *Cross and Cockade*, and another in the *American Aviation History Society Journal*. The subjects included French W.W.I camouflage and paint, one of Rickenbacker's planes, and a history of the FJ-1 development and operation. He's also working on the planning and construction of the C.A.H.A. (Connecticut Air History Association, if I remember correctly) Air Museum. . . . **Edward Patrick** has been promoted to Associate Professor of Electrical Engineering at Purdue University.

Doug Sinclair received the 1968 Adolph Lomb Medal at the Spring Meeting of the Optical Society of America; this Medal is awarded "to a person under 30 years of age who shall have made a noteworthy contribution to optics." The award was presented by the Chairman of the Lomb Medal Committee who said: "Dr. Sinclair has distinguished himself as a young optician in a wide area of experimental work with gas lasers while at the Institute of Optics of the University of Rochester." Doug received his Ph.D. in optics from Rochester in 1963; while there he constructed what was probably the first gas laser built in an academic institution. After service in the army, he was named an Assistant Professor in the Institute of Optics. Last year he joined the staff of Spectra-Physics as Manager of Laser Development. He has been working with noble gas ion lasers, increasing the maximum power available from this type of laser. . . . **Paul Tallerico** has joined the staff of the Los Alamos Scientific Laboratory in New Mexico to work in the Medium Energy Physics Division. He received his Ph.D. in Electrical Engineering from the University of Michigan. . . . **Dick Monahan** has been elected President and Treasurer of a newly-formed concern offering professional services in the areas of computer management and the management of closely-held firms. The company, Management Methods, Inc. (M.M.I.), is actively seeking business in the fields of computer programming, and systems design for business, scientific, software and data-reduction applications. Dick was previously the General Manager of the Business Services Division of

Philip Hankins and Company, Inc., and of Data-Service, Inc. . . . Keep me posted.—**Linda G. Sprague**, 345 Brookline Street, Cambridge, Mass. 02139

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Jonas Vizbaras, Architect, announces that **Marvin J. Richman**, A.I.A., has joined his firm as Senior Associate, Bronx, N.Y. . . . **Neil Doppelt** has just recently joined Arthur Andersen and Company as Senior Systems Analyst, in Marketing Information Systems area. Doppelt spent two years at Carnegie Tech's Graduate School of Industrial Administration, and three years with Esso International in N.Y. City before joining Arthur Andersen. . . . **Warren M. Zapol** is presently working on silicone membrane artificial lungs in application to hyaline membrane disease of the newborn, at the National Heart Institute. . . . **Ralph R. Rumer, Jr.**, is now Associate Professor and Chairman of the Department of Civil Engineering at the State University of New York at Buffalo. . . . **Gerald J. Fleischill** is taking internship at Hennepin County General Hospital and hopes to work with computers in medicine at N.I.H. next year. . . . **Susie (Kurtzner) and Alden Foster**, with their year-old son Wayne, spent last summer at the University of Bergen, Norway, where Alden set up a computer system. He is a Ph.D. candidate at M.I.T. . . . **C. Barton Yohn** has been promoted to Assistant Planning Analyst in the Prudential Insurance Company's Operations Analysis and Research Department. He joined the company in 1962 after graduation from M.I.T., is married and has two sons, David and Stephen. . . . **U.S.A.F. Capt. Niel K. Weatherbie**, is attending the Air University's Squadron Officer School at Maxwell A.F.B., Ala., where he will receive 14 weeks of instruction in duties and responsibilities of the command-staff team. Capt. Weatherbie was commissioned in 1962 upon completion of O.T.S. at Lackland A.F.B., Texas, and received a B.S. degree from M.I.T. in 1962. . . . **James Bueche**, a specialist in the application of EDP to inventory control recently represented Production Control of Honeywell Corporation at a demonstration of the use of EDP in purchasing and described the system in use in the division headquarters.

F. B. Sprow has been promoted to Research Specialist in Esso Research and Engineering Company's Baytown Synthetic Fuels Research Laboratory and is engaged in development of fuels from raw material sources other than petroleum. Dr. Sprow holds bachelor's and master's degrees in chemical engineering from M.I.T., a Ph.D. from the University of California at Berkeley, and is a member of American Institute of Chemical Engineers. Dr. and Mrs. Sprow and their children, John and Diane, live in Houston. . . . **R.C.A. Defense Electronic Products** has announced the appointment of **John**

R. McAllister, Division Vice President and General Manager, Aerospace Systems Division, Burlington, Mass. . . . **E.G. and G. International, Inc.**, has recently marketed the first of its newly developed Mark I Dual Channel Side Scan Sonar Systems, which was developed by **Martin Klein**, assisted by Murray Bubar and Fred Squires. This new sonar concept is used for offshore engineering surveys, salvage projects, ocean bottom mineral explorations, underwater cable and pipeline projects or for any other project where a broad acoustic "look" at the ocean bottom is desired. Our congratulations to Martin Klein. . . . **John M. D'Albora** is now working at the U.S. Naval Underwater Weapons Research and Engineering Station in Newport, R.I., and lives in Tiverton, R.I., with wife Barbara and four children, John Stephen (4), Mary Beth (3), Mathew Christopher (2) and Jennifer R. (8 months).—**Gerald L. Katell**, Secretary, 310 Hoge Building, Seattle, Wash. 98104

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David Bivins is working on his Ph.D. in civil engineering at M.I.T., while his wife Bonnie (Wheelock, '67) teaches in Newton. . . . **Dick Boy**, '63, is a Professor at the University of Michigan, and has been a Visiting Professor at Berkeley this spring. . . . **Gary Brooks** is working for the Trane Company in Wilmington. He has a two year old daughter and expected another child in June. . . . **Peter Chesbrough** expected his Ph.D. in June in operations research at Georgia Tech. His wife Myra Sands received her B.A. in sociology at the same time from Georgia State College. . . . **Tom Cheek** was co-author of a pamphlet for the Navy last year on the subject of a low cost graphic display for a computer console. . . . **Jack Downie** took time out to write a nice letter concerning his past and present activities. Until June of 1967 he worked for Gillette in Boston, during this time he worked his way up to Manager of one of their departments, received his M.B.A. from B.U. by going to night courses, and married the former Darlene Woods of Waterville, Maine. Jack and his wife are now living in St. Louis, where he is a Second Lieutenant in the Army, working as a development engineer on tactical aircraft systems. He will be discharged in August, 1969. . . . **David Evans** expects his Ph.D. in E.E. this year from M.I.T. He and his wife Betsy had their first child, Judith Park, last Halloween. . . . **Larry Feiner** received his Ph.D. in math last year at M.I.T., and is now an Assistant Professor in Math at the State University of New York in Stony Brook.

Edward Foster, '63, has finished his Ph.D. at Berkeley and was working for the Jet Propulsion Labs until Uncle Sam called. He hopes to be re-assigned there through N.A.S.A. . . . **John Freeman** is back at Sandia Corporation in Albuquerque after taking off a year to get

his Ph.D. at the University of New Mexico. His wife Robbie teaches math at a junior high there. . . . **Ernest Glickman** completed his Air Force commitment last July and received the Air Force Commendation Medal for his service. He is now working as a Management Consultant for Harbridge House, Inc., in Boston. . . . **Eric Greenwell** is working in computer systems at Richland. He has been quite successful in his hobby of racing his TR-4 sports car, coming in third overall in his class last year. . . . **Robert Hershey** recently left Bell Labs to become Manager of Underwater Acoustics and Transducers at Weston Components Division in Poughkeepsie. He supervises a group project in the development of devices for anti-submarine warfare. . . . **Robert Hybels** is completing his last year of med school at the University of Michigan. His wife Judy is working toward her Ph.D. in economics. Their favorite sport is skiing. . . . **Howard Kirkendall** has recently been promoted to a Systems Analyst at Johnson and Johnson. He has been with the firm since 1965, and is now working on his M.B.A. at N.Y.U. . . . **Fred MacKintosh** recently received his Ph.D. from M.I.T., and this spring became an Assistant Professor in the Department of Biological Science at Florida State. . . . **Tom Marnane** is a Navy Lieutenant working as Assistant Repair Superintendent for Testing at the Charleston Naval Shipyard.

Margaret MacVicar received an N.S.F. fellowship last year for postdoctoral studies at Cambridge University in England. . . . **Pedro Mora-Mean** was recently appointed Director of Water Resources Studies for the Puerto Rico Aqueduct and Sewer Authority. He is working on a comprehensive water development study projected to the year 2020. . . . **Paul Ortiz de Montellano** was awarded an N.S.F. fellowship last year for postdoctoral study at the Swiss Federal Institute of Technology. . . . **Paul Newell** has been appointed Director of the Center for Bio-engineering at the University of Alabama. . . . **Henry Nobles** has been traveling in Southeast Asia as a Systems Analyst for D.O.D. this year. . . . **Peter Ordeshook** wrote a letter just before this issue's deadline saying that he planned to move to Pittsburgh in June to assume his new po-

sition as Assistant Professor of Industrial Administration and Political Science at Carnegie-Mellon. He has received his Ph.D. in political science from the University of Rochester by this time. . . . **Ramunas Skrinška** is working on his Ph.D. in instrumentation at M.I.T. He spent last summer working on satellite stability at Aerospace Corporation. . . . **Wayne Stern** is ready to enter his last year of med school at the University of Rochester. . . . **Leonard Theran** is working as a Sales Engineer for Teradyne in Boston, a firm making electronic testing equipment. . . . **William Wallace** received his S.M. and E.E. degrees last year from M.I.T. and is now working for MITRE Corporation. . . . **J. Wesolowski** is leaving this month for Peru to become Financial Manager there for Squibb and Sons. He has spent the last three years in the Caribbean as Sales Manager for Squibb. . . . This completes the news for this volume of the *Review*. I hope you all have a good summer and will keep me informed of your activities. —**Ron Gilman**, 1021 Oakmont Place, Apt. 8, Memphis, Tenn. 38107

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Greetings again from the Cleveland outpost. Most of the news below was taken from the backs of the Alumni Fund envelopes which tend to be somewhat sparse in their content. How about dropping letter concerning your individual doings sometime this summer? . . . **Ray Fisher** is studying for his Ph.D. in plasma physics at Caltech. Among his classmates are **Dave Hall**, **Jim Downward**, and **Bob Menzies**. Bob married the former Miss Donna Sandmyer in August, '66. . . . **John Krause** is serving as Assistant Quality Assurance Officer at the Office of the Supervisor of Shipbuilding, U.S.N., Groton, Conn. He married the former Miss Linda Blaker in September, 1966, and is planning to enter graduate school this coming September for a master's in ocean engineering. . . . **John Holzer** is an Assistant to the Vice President at Digital Equipment Company and is co-ordinating the Engineering, Production and Marketing Departments. . . . **Tom Perrone** has been promoted to First Lieutenant and is stationed at Stewart A.F.B., N.Y.

Rowland Cannon is working in Lowell, Mass., for the Space Systems Division of the Avco Corporation. . . . **Jim Mac-Millan** was wed to the former Miss Sue Anne Larsen in October, 1967, and is now completing his third year at the Case Western Reserve Medical School in Cleveland. . . . **Bruce Skinner** is now teaching at the Coast Guard Academy after spending two years in the Merchant Marine's Washington Technical Division. . . . **Frank Gerstle, Jr.**, married the former Miss Louise Tallmadge of Los Alamos in August, '67, and is returning to Duke for Ph.D. work.

Bruce Zotter is working at the G.E. Knolls Atomic Power Lab in Schenectady, N.Y. . . . **Charles McBride** is a Systems Analyst at the Institute for Defense Analyses. . . . **John Holdren**, his wife Cheri and son Craig are at Stanford where John is working on a Ph.D. in plasma physics. . . . **Bob Morgan** has been commissioned a Second Lieutenant in the Air Force and has been assigned to McConnell A.F.B., Kansas, for duty as an Information Officer. . . . **Bruce Bottomley** is doing electrical engineering work for the Army in Germany and will marry Miss Sue Anne Lapiere in September. Both will start graduate work at Washington State University. . . . **Jim Hester** is back at M.I.T. doing Ph.D. work in city and regional planning.

Ed Hoffer spent the summer in Montreal and Stockholm and is back at Harvard Med School completing his third year's work. . . . **Ron Mandle** is at the Army Engineer School at Fort Belvoir, Va. . . . **George Berry** and his wife Jean have moved to California, where he is now working for Hewlett Packard. . . . **Gil Falk** and Miss Ronnye Coren of Norfolk, Va., are engaged with an August wedding planned. Ronnye is a graduate of Jackson and is getting a master's in library science at Emory. Gil is continuing his doctorate work in computer science at Stanford. . . . **Chris Ebbe** has been assigned to Lackland A.F.B., Texas, as a Clinical Psychologist. . . . **Dan Bartell** is engaged to Barbara Kubick of South Orange, N.J. Dan is a Program Analyst at Bell Labs, Whippany, N.J. . . . **Sharon Ross** received her M.A.T. from Harvard and is now teaching high school in Atlanta.

Juris Ekmanis is now doing Ph.D. studies at Harvard after completing his master's work in organic chemistry at Yale. . . . **Ed Kampman** is continuing his Ph.D. work in city planning at Berkeley in between skiing and kayaking. . . . **Harry Don** was married in 1966; spent two years as an Engineering Duty Officer at Hunters Point Naval Shipyard, San Francisco; and is now back in Boston as an Actuarial Trainee for John Hancock. . . . The **Dick Ayers** had their first child in August—a girl named Ashley. They are living in Westboro, Mass., where Dick is the Head Foreman of the Wyman-Gordon Company's Grafton Plant Machine Shop. . . . **David Cook** is at the University of Chicago school of medicine. . . . **Allen Zaklad** is working on his Ph.D. in mathematical psychology at the University of Pennsylvania. . . . **Ray Geiger** is currently an Assistant Professor in Architecture and is teaching first and third year design. . . . **Peter Klock** is a graduate student at Johns Hopkins and recently married the former Miss Sue Hallock of Wellesley College. . . . And finally, **Hank Lichstein** seems to be enjoying the bachelor life in Dallas.—**Jim Wolf**, Secretary, 24455 Lakeshore Boulevard, Euclid, Ohio 44125

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Henry Link is in mechanical engineering at the Rensselaer Polytechnic Institute after having toured Europe last summer with **Chuck Spann**. . . . **Janet Alper** is with Boeing Aircraft in Seattle, Wash., and would like to hear from her classmates. . . . **Roy Lindorf** has been with Lockheed while working for his M.S. in electrical engineering at Stanford. . . . **Paul Flanagan** received his master's in operation research from M.I.T. in June. After taking a month off to get married, he plans to work for Lambda Corporation in Arlington, Va. . . . **Walt Rode** plans to be an N.S.F. chemistry student at Cal Tech until he is drafted. . . . **Joseph Sansone** is a full-time graduate student at the University of Rhode Island. . . . **Alan Wolff** graduated from the Navy Officer Candidate School, Newport, R. I., on April 5, 1968, and is now on active duty as an Ensign on the U.S.S. *Little*

Rock, the flagship of the Sixth Fleet. . . . **Alan Perelson** is studying biophysics at Berkeley; Alan recently became engaged to Janet Gerard of South Orange, N.J., a graduate of Simmons College. . . . **Dennis Bray**, Ph.D., has been appointed a Research Fellow in Neurobiology at the Harvard Medical School. . . . **John Labadie** has been commissioned a Second Lieutenant in the U.S. Air Force upon graduation from Officer Training School at Lackland A.F.B., Texas. He has been assigned to Chanute A.F.B., Ill., for training as a Missile Launch Officer with the Strategic Air Command.

Fraternity brother **Chuck Hottinger** visited me for several days during an interview trip to the West Coast; we had a rather good time seeing the prominent points of San Francisco. . . . **Al Hayes** is in the electrical engineering master's program at M.I.T. . . . Mrs. **Carlyn Voss Iuzzolino** has been working as a Systems Programmer at M.I.T.'s Computation Center. . . . **Edward Jakush** is in technical management with Procter and Gamble. . . . **Thomas Jensen** married the former Miss Mona Dickson and is now attending the University of Vermont with a three-year fellowship. . . . **Mike Kruger** was a Civil Engineering Research Assistant at M.I.T. during the past year. . . . **Loughrey Kuhn** is attending the M.I.T. Sloan School of Management. . . . **Russel Perkins** married the former Miss Martha Ann LaPoint in June, 1967. . . . **Monte Strauss** is an engineer with Douglas Aircraft. . . . **Arthur Veitch** is an associate engineer with General Dynamics in Quincy. . . . **Art Warshaw** has been attending the Harvard Business School. . . . **Wayne Porter** has a staff position in the Electronics Research Laboratory of the Syracuse University Research Corporation. . . . In July, 1967, **Ken Follansbee** married the former Miss Janet Monty of Suncook, N.H. During the past year Ken was a Civil Engineering Research Assistant at M.I.T. . . . **Paul Ness** married the former Miss Barbara Don, a graduate of Ohio State University, in June, 1967, and is now attending medical school at the State University of New York at Buffalo. . . . **Carol Shattles** is a Teaching Assistant at Purdue. . . . **John Ritsko** married the former Miss Dottie Brainerd of Simmons

College in June, 1967. John has been studying physics at Princeton. . . . That's it for now.—**Jim Swanson**, 1816 First Avenue North, Grand Forks, N. D.

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Due to the uncertainties of the draft, few people seem to have definite plans for next year. When you do know what you'll be doing please drop me a line and I'll try to get it in the class notes as soon as possible. . . . As for the classmates whom I do know something about, **Mark McNamee** will be going to Stanford in chemistry along with **Gary Bjorklund** who will be there in physics. . . . **Leonnie Mausner** will be at the University of Chicago in the Chemistry Department. . . . **Claude Gerstil** is getting married this summer to Ellen Cohen and will be at N.Y.U. Medical School. . . . **Al Singer** is planning to go to Columbia Med. . . . **Ellen Colmer** was married on June 9 to William Domb and will be at the University of Pennsylvania while he'll be teaching nearby. . . . **Ken Wacks**, **Craig Kirkwood**, **Steve Finn**, and **Bob Rausch** will be among the many back at M.I.T. in Course VI. Craig and Ken have N.S.F. Traineeships.

Paul Debevec will be at Princeton next year in physics. . . . Finally, three pairs of classmates including your Secretary were married at graduation time: **Rick Karash** and **Karla Hurst** were married on June 1 in Middleburg, Ohio. Karla will be back at M.I.T. in urban systems and Rick plans to work for a second S.B. . . . **Pete Sorant** and **Alexa Mokede** exchanged vows on June 9 in Brookline, Mass., and plan to be in the Boston Area next year. . . . **Gail Halpern** and I were married also on June 9 in Asbury Park, N.J. We'll be living in Asbury Park during the summer and would welcome any classmates who will be visiting the area. This fall Gail will be in Course XXII and I'll be back in old Course VI. Gail has agreed to help out with the Class Secretary business so we're waiting to hear from you.—**Mike Marcus**, Secretary, Apt. 23, 512 Fifth Avenue, Asbury Park, N.J. (until September); c/o *Technology Review* (after September)

Course Review

V

Charles R. Milone, Ph.D. 1939, has been named to the newly created position of Director of Research and General Products Development at the Good-year Tire and Rubber Company, Akron, Ohio. He attended Ohio University, 1931-1933, transferred to M.I.T., was awarded the S.B. degree in 1936 and accepted a position as a Research Chemist with Goodyear on completion of his requirements. In 1952 he was appointed Superintendent of the Atomic Research Laboratory of the Good-year Atomic Corporation, operator of the government plant under construction in Ohio; in 1957 he was named Manager of the Technical Division of Goodyear, and in 1967 Director of General Products Development. Our departmental files on Ph.D.'s who were awarded their doctorates in 1939 show a salary range of \$2,600-\$2,800, 12 months—no moving or transportation allowances. . . . Once in awhile we catch up with someone we have lost track of through the *Chemical and Engineering News* of the American Chemical Society. **Gilbert E. Moos**, B.S. St. Lawrence University 1936, S.M. in chemistry at M.I.T. 1937 and Ph.D. in 1939, taught at Rollins College in 1940, entered industry with the Plastics Division of the Celanese Corporation, then back to St. Lawrence on the faculty staff in 1952. The A.C.S. *Journal* carried an ad for Ph.D. to teach—reply to the Chairman of the Department of Chemistry, Gilbert E. Moos, State University College, Fredonia, N.Y. Dr. Moos participated in five sports as an undergraduate at St. Lawrence College, was a Teaching Assistant at M.I.T. when funds were scarce and a junior staff appointment limited to two academic years. Odd jobs and fellowships financed a candidate from then on—but research was a bit simpler but educationally just as valuable, judging from the results.

Dewey J. Sandell, B.A. Montana State University, March 1946; Ph.D. 1949, M.I.T., represented the Institute at the inauguration of John Wesley Chandler as President of Hamilton College on April 20. Dr. Sandell is the Director

of the Research Division of the Carrier Corporation, Syracuse, N.Y. Dr. Sandell accepted a position with the Du Pont Company in August, 1949, joined the staff of Ohio State University in 1951 and the Carrier Corporation in 1960. His research at M.I.T. was under the direction of Professor Frederick A. Keyes. Dr. Sandell was a First Lieutenant (Infantry) U.S. Army from August, 1943, to November, 1945, and was awarded the Infantry Combat Badge and the Purple Heart with Cluster and the Silver Star. . . . **Dean E. Welch**, B.A. 1959, Monmouth College, Monmouth, Ill.; Ph.D. 1963, M.I.T., has been appointed Director of Quality Assurance for Salsbury Laboratories, Charles City, Iowa. He joined the Laboratory as an Associate Scientist in Organic Chemistry in 1964 from the Escambia Chemical Corporation Research Center, Wilton, Conn. Dean was the holder of a National Institutes of Health Predoctoral Fellowship in his final year of graduate study. His research was directed by Professor Diermar Seyferth.

The Public Relations Office of the Du Pont Company has announced the promotion of **Joseph Eiseman**, Ph.D., 1927, from Technical Associate to Research Associate in recognition of his research in the field of "freon" fluorinated hydrocarbon compounds and their application to refrigerants. He graduated from the Georgia Institute of Technology, was awarded the doctorate and continued at M.I.T. as a Research Associate, 1927-28. He continued his education at the University of Paris and the University of Berlin. He joined the Du Pont Company in 1941 as a Chemist and Chemical Engineer at the Chickasaw Ordnance Works, operated by Du Pont for the Government in Memphis, Tenn. During the latter stages of World War II, he worked as a Chemist for the Du Pont Company in Atomic Energy Commission projects at the University of Chicago and Hanford Engineering Works. He has been working in the field of refrigerants since he was transferred to Du Pont's Jackson Laboratory at Carney's Point, N.J., 1945. . . . **Albert C. Zettlemoyer**, Distinguished Professor of Chemistry at Lehigh University awarded in 1960, Vice President of Research at Lehigh,

1966, has been awarded the Kendall Company Prize in Colloid Chemistry. He gave the award address on "Hydrophobic Surfaces" at the 155th American Chemical Society National Meeting in San Francisco, April, 1968. Dr. Zettlemoyer received the B.S. degree in chemical engineering in 1936, the M.S. degree in organic chemistry, Lehigh 1938, and the Ph.D. in physical chemistry at M.I.T. in 1941. He has been the recipient of many previous honors, including the R. R. and E. C. Hillman award in 1966, the highest honor Lehigh bestows upon a faculty member. Those of you who read the publications of the American Chemical Society are aware of his contributions to chemistry in colloids and the mechanism of metal corrosion.

I met **Henry A. Hill**, President of the Riverside Research Laboratories, Haverhill, Mass., on one of his visits to attend a meeting at M.I.T. and we had a chance to talk about old times. I have the greatest admiration for him as an administrator, a chemist, and as one who devotes much of his time to the advancement of his profession. Henry was awarded the B.S. degree in mathematics and chemistry from the Johnson C. Smith University, Charlotte, N.C., in 1936. He entered M.I.T. as a special undergraduate student in chemistry in preparation for admission to graduate school and was awarded the doctorate in 1942. Money in the form of fellowships was not plentiful in the early '40's; for one year, his last, he was assisted financially as a Julius Rosenwald Fellow. Starting as a Research Chemist he was promoted successively to Director of Research and Vice President of Atlantic Research Associates, a subsidiary of the National Dairy Corporation. From 1946-1952 he was a Group Leader in Organic Research at Dewey and Almy Chemical Company, Cambridge. Henry was awarded an honorary degree of Doctor of Science by his alma mater in 1961. He has been particularly active in the American Chemical Society, the local Northeastern Section, the American Institute of Chemists and the American Association for the Advancement of Science, and has recently been appointed the Chairman of the Committee

on Professional Relations, one of seven standing committees of the American Chemical Society.

Joseph T. Vanderslice, B.S. Magna Cum Laude, Boston College, June, 1949; Ph.D. physical chemistry, M.I.T., September, 1952, has been appointed Head of the Department of Chemistry at the University of Maryland. Our information also states that he will continue as Director of the Institute of Molecular Physics. Dr. Vanderslice, while at M.I.T., was a Teaching Assistant and was awarded the Allied Chemical and Dye Predoctoral Fellowship for the academic year 1951-52, with a stipend and full tuition of \$400 each academic term. On completion of his requirements for the doctorate he accepted an Instructorship at the Catholic University, Washington, D.C., and since our records are not complete we assume the transfer was from Catholic University, where he held a responsible position. . . . The *Wall Street Journal* "Who's News" of March 29, 1968, announced the nomination for election of **Gerald D. Laubach** (Ph.D., organic chemistry, 1950) as Director of Charles Pfizer and Company, producer of antibiotics and specialty pharmaceuticals. Gerald Laubach served in the U.S. Navy from February 14, 1944, to February 27, 1946, and was commissioned an Ensign (U.S.N.R.). He was awarded the A.B. degree in chemistry from the University of Pennsylvania in June, 1947, and entered M.I.T. as a candidate for the doctorate in the Fall. His program as a Teaching and Research Assistant was supervised by Professor John Sheehan and he entered the employ of Pfizer on completion of the requirements for the doctorate. In May, 1964, he became Vice President for Medicinal Products Research and Development. . . . News in this column is limited to non-Tech undergraduate-graduate students. Perhaps we should say that **Robert B. Woodward**, S.B. V, Ph.D. V, both M.I.T., was also nominated for a Directorship. His accomplishments are well known to those in the chemical profession.

According to a news release from the Office of Public Information at Lehigh University, **Alfred J. Diefenderfer**, S.B. University of Pittsburg, 1957; Ph.D. in analytical chemistry M.I.T., February, 1961, has been selected to serve as a National Science Foundation Consultant at the University of Rajasthan, Jaipur, India. Dr. Diefenderfer has been a member of the Lehigh University faculty since 1961 when he was appointed an Assistant Professor and has been an Associate Professor since 1964. He served in the U.S. Army for three years—May, 1951 to May, 1954—attended the University of Virginia (in liberal arts), transferred to the Carnegie Institute of Technology (architecture), tried Penn State in hotel administration, and made the right decision—to become a specialist in analytical chemistry at M.I.T. In 1959-60 he was awarded the General Electric Company Predoctoral Fellowship and in 1964 was awarded the Alfred

Noble Robinson award at Lehigh as a member of the faculty "not over 35 and below the rank of associate professor for performing outstanding service in behalf of the University and for showing excellent promise." His research interests are in absorption spectrometry, electrochemical reduction mechanisms, flame photometry and instrument electronics design. While at M.I.T. he worked under the direction of Professors Hume and Rogers.

James W. Beatty, B.S. 1956, North Dakota Agricultural College, Fargo, N.D.; Ph.D. M.I.T., 1960, an Assistant Professor at Ripon College, Ripon, Wis., has been awarded the Severy Award for outstanding teaching. The award was established with a bequest to Ripon by Mrs. May Severy, Ripon 1908, who specified that income from the fund be used to augment the salaries of professors who have outstanding teaching records. Dr. Beatty taught for three years at Colby College, Waterville, Maine, and joined the staff at Ripon in 1963. In 1959-60 Dr. Beatty held the Procter and Gamble Predoctoral Fellowship in chemistry at M.I.T. He specialized in physical chemistry, working under the direction of Dr. Amdur. . . . **Samir B. Hanna**, B.Sc. 1952; M.Sc. 1953, University of Alexandria, Egypt; Ph.D. in organic chemistry June, 1963, now an Associate Professor in the Department of Chemistry and an Associate at the Graduate Center for Materials Research at the University of Missouri, Rolla, Mo., has been elected the First Chairman of the South Central Missouri Section of the American Chemical Society. Dr. Hanna was awarded the Arthur D. Little Memorial Predoctoral Fellowship at M.I.T. for the academic year 1961-62, and was a Research Assistant and a Research Associate with Professor C. Gardner Swain prior to accepting an Assistant Professorship at the University of Missouri in 1963.—**Leicester F. Hamilton**, Correspondent, M.I.T. 4-254, Cambridge, Mass. 02139

VI

Anton Poeltinger, S.M.'62, accompanied by his father, Mr. Anton Poeltinger, Sr., revisited the Institute in May for a few days at the close of a two-week tour of the United States. In the course of this trip, the Poeltingers visited **Nicholas Gothard**, S.M.'62, who is Assistant Professor of Electrical Engineering at Texas A and M University having received his doctorate at Cornell University. Now a Captain with Austrian Airlines, Mr. Poeltinger is flying the Hawker-Siddeley 748 on domestic runs and the shorter foreign routes out of Austria. He is interested in both the operational and technical aspects of aviation. His flying activities began in the spring and summer of 1962 when as a member of the M.I.T. Flying Club at Hanscom Field he qualified for a private pilot's license. After further training with Austrian Airlines, he received the commercial and instrument rating and progressed as

copilot from the DC-3 to the Viscount and Caravelle jets. The last evening of his Cambridge visit was spent with **Helmut Milde**, S.M.'62, who came to study at M.I.T. in 1960 along with Mr. Poeltinger, and is back as a permanent resident after three years with Brown-Boveri in Switzerland. . . . **John M. Cochran, Jr.**, S.M.'64, was elected Vice President and a member of the Board of Directors of Frontier Electronics, Inc., Greenville, S.C., at the annual stockholders meeting. During 1967 the company moved into new offices and a manufacturing plant located on Poinsett Highway near Furman University. An engineering department for design and development of new products and systems has been formed. New activities include entry into the field of textile monitoring systems and the adaptation of the Frontier F-100 System to automatic winding. Mr. Cochran's undergraduate work was done at Georgia Institute of Technology. He was employed at M.I.T.'s Instrumentation Laboratory from June, 1961, to September, 1964.

Yehuda Golahny, S.M.'54, has mentioned his pleasure in reading Professor **Howard Card**'s letter in the March issue of *Technology Review* which reported on several alumni who were fellow students and teaching assistants at M.I.T. Mr. Golahny is a consulting engineer with headquarters near M.I.T. As General Manager of I.R.I. Company (Instruments for Research and Industry), he is currently spending about half his time on instrumentation for the M.I.T. Magnet Laboratory. His work falls into two general types, the development of instruments for research laboratories where there may be only one or two of a kind, and commercial instrumentation which usually ends in a manufactured product for industrial or medical application. On a recent trip to Israel, he developed some instrumentation for the Physics Department of the Hebrew University in Jerusalem. He previously held positions at Raytheon, Baird Atomic and Mithras. . . . **Edward R. Coop**, S.M.'27, has given a 10-week course in Providence, R.I., on the distribution of electric power. The sessions were held at Brown University and were sponsored by the local branch of I.E.E.E. Mr. Coop was employed by the Narragansett Electric Company soon after his graduation from M.I.T. and held the position of Division Engineer in that company at the time of his recent retirement.

Ernest G. Holzmam, S.M.'51, formerly Senior Scientist at the Syracuse plant of the General Electric Company, received an N.S.F. Co-operative Fellowship to study at Stanford University, taking up residence with his wife, Martha, and six children in Stanford's married student housing in Escondido Village. Last fall he was appointed a Research Associate in the Materials Science Department and is looking forward to completion of Ph.D. requirements by this June. . . . **Elliot N. Pinson**, S.M.'57, has been promoted to Head of the Computer Systems Research Department at Bell Telephone Laboratories, Murray



Elliot N. Pinson, VI, S.M.'57

Hill, N.J. His new responsibilities include technical direction of B.T.L. computation center as well as research on computer analysis and synthesis of speech and has co-authored a book, *The Speech Chain—The Physics and Biology of Spoken Language*. He received the B.S. degree, summa cum laude, from Princeton in 1956 and the Ph.D. degree from the California Institute of Technology in 1961. . . . **Paul T. Brady**, S.M.'60, has reported his recent work at Bell Telephone Laboratories in an article in the January, 1968, *Bell System Technical Journal*. The report deals with statistical analysis and modeling of on-off speech patterns. Dr. Brady is also studying two-way transmission of speech and data on circuits containing transmission delay. New York University awarded his Ph.D. degree in 1966.—**Karl L. Wildes**, Correspondent, Room 4-232, M.I.T., Cambridge, Mass. 02139

XIII-A

Frank Omohundro, Nav.E.'49, visited M.I.T. in connection with the new Ocean Engineering Program. Frank is currently at Woods Hole Oceanographic Institution where he is Engineering and Certification Manager of the Deep Submersibles Section. Frank and Betty are living in Falmouth. Their daughter, Linda, is studying journalism at Syracuse University; and son, Bruce, is in grade school in Falmouth. . . . Commander **C. O. Swanson**, U.S.N., Nav.E.'53, recently attended the 16-week program for managerial development at the Harvard Business School. Chuck is on T.A.D. from the Office of the Supervisor of Shipbuilding, Groton, where he is currently the Quality Assurance Officer. . . . On March 6 the Department of Naval Architecture and Marine Engineering got together to honor Gladys E. Duncan as she began her retirement after 17 years of service. Over 300 XIII-A graduates will remember Gladys as the person who found that obscure reference or plan for them in the department's library during their struggles at M.I.T. A plaque was presented at the reception and is now hanging in the library. She is now staying with relatives at the following address: Miss Gladys E.

Duncan, c/o Captain Edward Baker, P.O. Box 365, Pictou, Nova Scotia.

On 29 April Mrs. Cochrane, widow of Vice Admiral **Edward L. Cochrane**, M.S.'20, unveiled a model of the guided missile destroyer, DDG-21, named for Admiral Cochrane. The ceremony was attended by members of the Institute together with the Visiting Committee of the Department of Naval Architecture and Marine Engineering which included Rear Admiral W. A. Brockett, M.S.'43, Supervisor of Webb Institute; and **Henry A. Arnold**, M.S.'41, who is on the staff of the National Council on Marine Resources and Engineering Development. . . . The following officers will graduate from M.I.T. this June and are going to duty stations as indicated: Duane Duff—Puget Sound Naval Shipyard; Frank Eissing—Newport News Naval Shipyard; Bill Ellison, Dave Greene, and Pete Tarpgaard—M.I.T. (doctoral candidates); George Fang, Mike Tamny, and George Wagner—Naval Ship Engineering Center; Dave Greeneisen—Naval Applied Science Lab., Brooklyn, N.Y.; Kurt Gustafson—Supervisor of Shipbuilding, New Orleans; Frank Holmes—U.S.S. *America* (CVA-66); Dick Howson—U.S.S. *Galveston* (CLG-3); Dick Kinnear—Supervisor of Shipbuilding, San Diego; Harry Lewis, Pete Regan, and Ron Render—Pearl Harbor Naval Shipyard; Gill Livingston—Norfolk Naval Shipyard; Bill Marsh—Deep Submergence Systems Project, San Diego; Lou Matjasko—Portsmouth Naval Shipyard; Granval Morrow—Charleston Naval Shipyard; Fred Richmond—Supervisor of Shipbuilding, Groton; Jim Schaff—Long Beach Naval Shipyard; Bob Steele—Mare Island Division, San Francisco Bay Naval Shipyard; George Trotman—Philadelphia Naval Shipyard; George Casimir—Merchant Marine Technical, New York, U.S. Coast Guard; Warren Snider—Merchant Marine Technical, New Orleans, U.S. Coast Guard; Dick Kiessel—Headquarters, U.S. Coast Guard, Merchant Marine Technical; Bob Major—Headquarters, U.S. Coast Guard, Naval Engineering.—**Robert E. Stark**, Correspondent, M.I.T. 5-317, Cambridge, Mass. 02139

XV

C. H. Kollenberg, '62, has been named to the newly created post of Manager of Supply Coordination and Pricing in Humble Oil and Refining's Headquarters Marketing Department in Houston. . . . **J. B. Galloway**, '65, was promoted to Aerospace Director of Antiballistic Missile Programs and Research and Engineering at Thiokol Chemical, Huntsville, Ala. . . . **Philip H. Lawrence**, '62, has been named to the new position of General Technical Manager for the B. F. Goodrich Chemical Company, Ohio. . . . **John R. McAllister**, '62, has become Vice President and General Manager of the Aerospace Systems Division, R.C.A., Burlington, Mass. . . . Controlling interest in the United Tool and Industrial Supply Company, Inc.,

of Lawrence, Mass., was recently purchased by **Robert P. Sumberg**, '59. Mr. Sumberg was formerly Executive Vice President of Cabot, Cabot and Forbes, and for 10 years was Financial Vice President and controller of Avco Research and Advanced Development Division. . . . **Anthony Mediate**, '53, has been promoted to Marketing Manager by I.B.M., Cleveland, Ohio. Mr. Mediate joined I.B.M. in 1963 as a Systems Engineer in Youngstown. In 1966, he was promoted to Advisory Systems Engineer of I.B.M.'s Field System Center in Cleveland where he served until his recent promotion.

Sloan

William G. Kay, Jr., '63, Vice President of the Society of Sloan Fellows, and National Chairman for its fund raising effort, has notified us that preliminary results of the campaign for support of the Alfred P. Sloan Fellows Chair show a participation index of just over 50 percent and contributions received of \$25,202. Thus our goal of \$25,000 is well assured, and thanks are due to Class Chairmen and all Sloans who helped set a new record. Mr. Kay is President of the Management Team at Rival Pet Foods, Chicago. Prior to joining Rival, he was Vice President of Marketing and a Director of Pepperidge Farm, Inc. . . . **Harold J. Fitzgeorge**, '64, has been appointed President of the Mobil Oil Company of Venezuela

A. Bruce Burns, '62, has been appointed Vice President of Production, Chemicals and Plastic Products Division, of Union Carbide Corporation, New York City. He was formerly Plant Manager of the Chemicals Division of Union Carbide in Whiting, Ind. . . . **Edward S. Gill**, '58, Assistant Vice President of Operations for the Bell Telephone Company of Pennsylvania and the Diamond State Telephone Company, has recently been elected Marketing Vice President of the two companies. . . . **Robert W. Miller**, '52, Kodak Vice President, was appointed as Vice President, Finance and Administration, with responsibility for the operations of the Treasurer's and General Comptroller's Divisions of Eastman Kodak Company.

Edward G. Koepnick, '65, is Chief, Propulsion and Power Division, of the C-5 System Program Office, Aeronautical Systems Division, at Wright-Patterson Air Force Base, Ohio. . . . **R. Dewey Rinehart**, '56, has been named Director of Engineering at Martin Marietta's Orlando division. He was formerly with their Denver division. . . . The Alfred P. Sloan Fellows Program was saddened by the news of the death of **Robert M. Zimmerman**, '40, on January 13, 1968. Bob was Vice President and General Manager of the Lipe-Rollway Corporation in Syracuse, N.Y., where he had lived for the past 12 years. . . . Eugene Becken, '52, has been named Vice President, Systems Operations, of RCA Global Communications.

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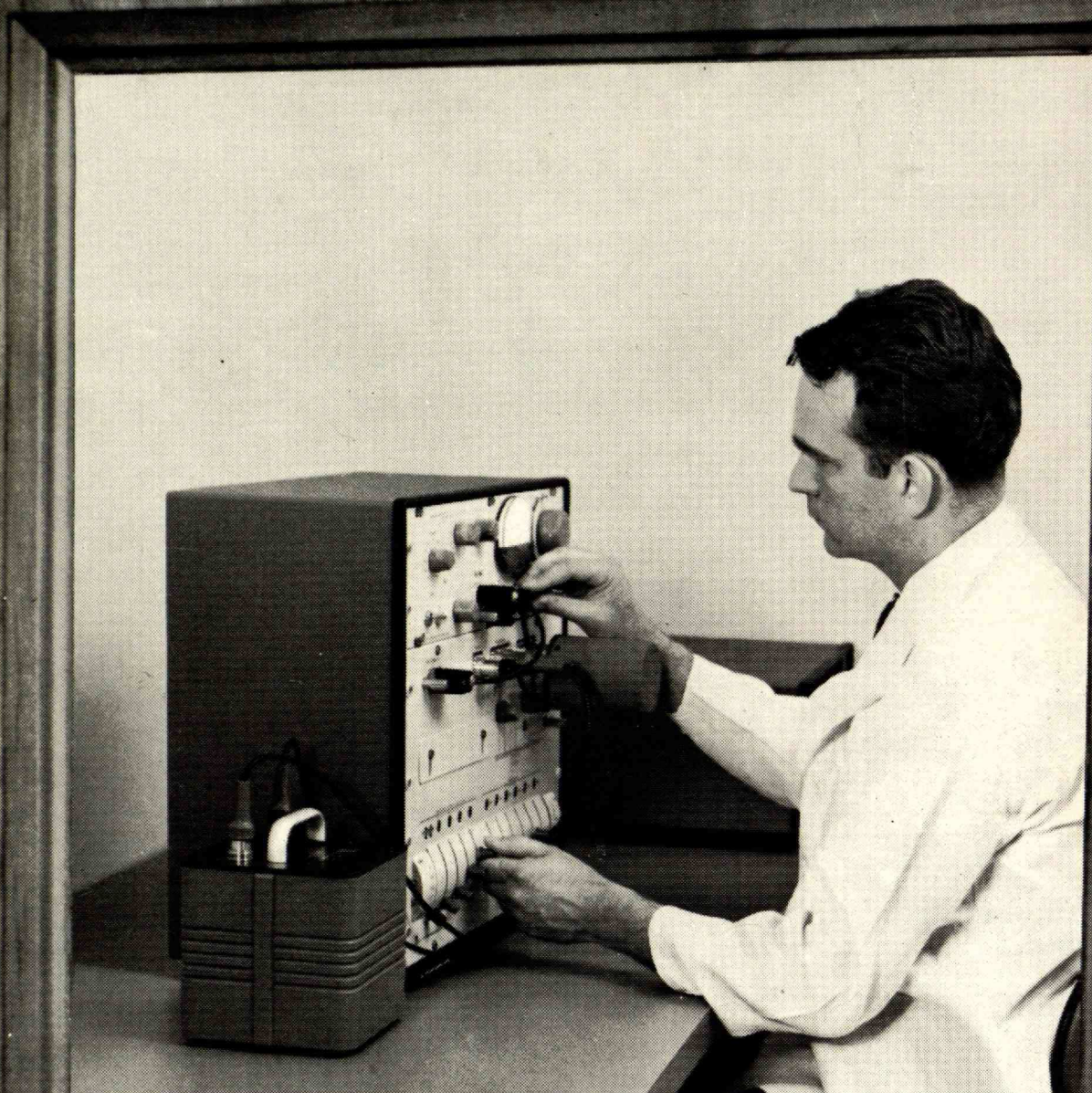
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